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Produced by the NASA Center for Aerospace Information (CASI)

final technical report

SPACE STATION NEEDS, ATTRIBUTES, AND ARCHITECTURAL OPTIONS

MAR 1984
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volume II - book 1
part IV — payload element mission data sheets

(NASA-CR-173515) SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 1, PART 4: PAYLOAD ELEMENT MISSION DATA SHEETS Final Technical Report (Grumman Aerospace Corp.) 299 p
N84-18299
Unclas
G3/15 18490



COMSAT GENERAL

GRUMMAN

GENERAL ELECTRIC

final technical report

SPACE STATION NEEDS, ATTRIBUTES, AND ARCHITECTURAL OPTIONS

volume II - book 1

part IV — payload element mission data sheets

prepared for

National Aeronautics and Space Administration
Headquarters
Washington, D.C. 20546

under contract NASW-3685
Space Station Task Force
Contracting Study Project Manager — E. Brian Pritchard

by

Grumman Aerospace Corporation
Bethpage, New York 11714

report no. SA-SSP-RP008

20 April 1983

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PAYLOAD ELEMENT NAME	CODE
Geological Processes in Low Grav.	GRUM0100

CONTACT

Name
Address

Telephone

REFERENCE
1, P-68
6, P-79

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1998
No. of flights ———
Duration of Flight, days ———

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

OBJECTIVE Develop an understanding of the processes that control the original and evolution of the planets. Some physical processes that operate on the planets (including the earth) can be studied and more completely characterized by conducting experiments in earth orbit where advantage can be taken of the unique gravity, pressure and radiation environments provided by a space station.

DESCRIPTION Wind tunnel: 1 long, 40 cm wide test section capable of wind velocities of 100m/sec.
Flume: test-bed 2m long and 0.5m wide, capable of discharges up to an equivalent of 1,000m w/sec.
Projectile Acceleration: Capable of accelerating 1 gravity mass to a velocity of 1 km/sec.
Centrifuge: Large enough to carry the wind tunnel, or flume, or projectile accelerator and target, along with high speed cameras, etc.
Levitation Chamber: 1 m by 1 m is required to conduct acceleration and condensation experiments.
High Temperature Furnace: Required to vaporize silicate materials for accretion and condensation studies.
External Sample Mount: Required for the exposure experiments.

II/1/ IV

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ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION into solar wind for exposure experiment

View direction ☐ Celestial ☒ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating		
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

III/1/IV
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THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Low g studies - continuous monitoring exposure, condensation & accretion, 1 day to 6 months.

V83-0165-408(T)

II/1/IV

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3

PAYLOAD ELEMENT NAME Atmos. General Circulation Exp.

CODE GRUM0125

CONTACT

Name Dr. S.L. Neste
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-2153

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr ~ 1993
No. of flights 1
Duration of Flight, days 1000

OBJECTIVE

Model the large-scale circulation of the earth's atmosphere.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

DESCRIPTION

The AGCE will be performed in the near zero-g environment of space station and will model the large-scale circulation of the earth's atmosphere in hemispherical geometry. The working fluid will be held between two concentric and subjected to a radial electric field to stimulate gravity. Temperature over the sphere's surface is controlled to maintain latitudinal temperature gradients similar to those encountered by the real atmosphere. Rotation of the earth is modeled by co-rotating the spheres. Fluid circulation is observed by recording distortions of dye patterns introduced into the fluid.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -
Inclination, deg any Tolerance ± -
Nodal Angle, deg any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known)
Pointing accuracy, arc sec Field of view, deg
Pointing Stability (Jitter) arc sec/sec
Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	520	0-8
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☐ Offline ☐ Other
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day
Film (Amount) Voice (Hrs/Day) 2
Live TV (Hrs/Day) Other
On-Board Storage (MBIT) 1000
Data Dump Frequency (Per Orbit)
Recording Rate (KBPS) 400 Downlink Frequency (MHZ)

II/1/IV

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	15	max	30
	non-operational min	5	max	45
Heat Rejection, w	operational min	280	max	280
	non-operational min	none	max	none

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m 0.5 W,m 0.8 H,m 2 Stowed

L,m 0.5 W,m 0.8 H,m 2 Deployed

Launch mass, kg 104

Consumables Types ____

Acceleration sensitivity, g min 0.001 max 0.01

CREW REQUIREMENTS

Crew Size 1 Task Assignment Experiment execution/monitoring

Skills (See Table B)

SKILL	3					
LEVEL	2					
Hrs/Day	0-8					

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

1. Experiment will consist of 1-2 days of data acquisition followed by days or weeks of analysis on ground; before next data taking session occurs.
2. Temperatures of critical components are controlled by heating elements or tems.
3. Heat retention to air cooling loop.
4. Simple maintenance will probable be required for each data session; experiment reconfiguration may be required every 6-12 months.

V83-0165-408(T)

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PAYLOAD ELEMENT NAME: Cardiovascular Experiments

CODE: GRUM 0151

CONTACT

Name: Dr. Ron White
MATSCO
Address: 1050 Bay Area Blvd.
Houston, TX 77258

Telephone: 713-488-9005

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr: 1992
No. of flights: 3
Duration of Flight, days: 180

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A): 4

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 10

OBJECTIVE

Perform human and animal studies to trace the time course of cardiovascular deconditioning; determine if the changes in cardiovascular status are reversible, and evaluate countermeasures. Assess fluid and electrolyte balance and its effect on the cardiovascular system.

DESCRIPTION

Non-invasive measurements of ECG, blood pressure, cardiac dimensions, blood flow, blood volume, etc. will be obtained from the crew to determine the time course of changes in cardiovascular condition and to evaluate countermeasures such as saline injestion coupled with lower body negative pressure.

Invasive studies on animals will use chronically implanted electrodes and catheters to monitor basic cardiovascular parameters. Animals will be sacrificed for morphological and histological examination of cardiac tissue and tissues of the major blood vessels.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -
Inclination, deg any Tolerance ± -
Nodal Angle, deg any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known)
Pointing accuracy, arc sec Field of view, deg
Pointing Stability (Jitter) arc sec/sec
Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	3000	
Standby		
Peak		

☒ Continuous

Voltage, V 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☒ Digital ☒ Hrs/Day 24
Film (Amount) TBD Voice (Hrs/Day) TBD
Live TV (Hrs/Day) TBD Other
On-Board Storage (MBIT) TBD
Data Dump Frequency (Per Orbit) TBD
Recording Rate (KBPS) 5000 Downlink Frequency (MHZ)

V83-0165-408(T)

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THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	3000	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

VOL 15 m^3

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 3500

Consumables Types TBD

Acceleration sensitivity, g min ____ max 10^{-4}

CREW REQUIREMENTS

Crew Size 8 Task Assignment Test Subjects

Skills (See Table B)

SKILL	2					
LEVEL	1					
Hrs/Day	30					

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

Crew requirements include special diets, procedures, tests and analyses.

III/1/IV

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PAYLOAD ELEMENT NAME — **CODE**

Hematology and Immunology Experiments — GRUM 0152

CONTACT

Name Dr. Ron White
Address MATSCO
1050 Bay Area Blvd.
Houston, TX 77258

Telephone 713-488-9005

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1995
No. of flights 5
Duration of Flight, days 180

OBJECTIVE

Document the time course of changes in the erythropoietic system during space flight and assess the effect of nutrition on the system. Assess the nature of the effect of longterm space flight on innate and acquired immunity.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 4

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 10

DESCRIPTION

Conduct metabolic and hematological studies on humans and animals including animal sacrifice as required. Studies will include dietary monitoring and control, mass balance, red cell mass changes, tracer studies, hormonal studies and histological examination.
Immunology experiments on humans and animals will analyze leucocyte changes, immunoglobulin concentrations and lymphocyte responses to specific mitrogens.
Animal holding units, a centrifuge, refrigerator and other equipment required to collect, analyze and store blood samples will be required.

V83-0165-408(T)

II/1/IV

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ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -
Inclination, deg any Tolerance ± -
Nodal Angle, deg any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known)
Pointing accuracy, arc sec Field of view, deg
Pointing Stability (Jitter) arc sec/sec
Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	3000	
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day 24
Film (Amount) TBD Voice (Hrs/Day) TBD
Live TV (Hrs/Day) TBD Other
On-Board Storage (MBIT) TBD
Data Dump Frequency (Per Orbit) TBD
Recording Rate (KBPS) 5000 Downlink Frequency (MHZ)

V83-0165-408(T)

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II/1/IV

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	3000	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

Vol. 13 m^3

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 3200

Consumables Types TBD

Acceleration sensitivity, g min ____ max 10^{-4}

CREW REQUIREMENTS

Crew Size 6 Task Assignment Test Subjects

Skills (See Table B)

SKILL	2					
LEVEL	1					
Hrs/Day	30					

EVA ☐ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

Crew requirements include special diets, procedures, tests and analyses.

V83-0165-408(T)

III/1/IV

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PAYLOAD ELEMENT NAME
Bone/Muscle Metabolism Studies

CODE
GRUM 0153

CONTACT

Name Dr. Ron White
Address MATSCO
1050 Bay Area Blvd.
Houston, TX 77258

Telephone 713-488-9005

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1994
No. of flights 7
Duration of Flight, days 270

OBJECTIVE

To assess the biochemical, histological and electromyographic nature of muscle atrophy and associated metabolic changes during space flight.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 4

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 10

DESCRIPTION

Perform muscle and protein metabolism studies on animals and humans to evaluate specific countermeasures to muscle atrophy such as diet and exercise. Typical experiments include tracer studies, biostereometric analysis, metabolic balance, histological examination and muscle strength tests.

ORBIT CHARACTERISTICS

Apogee, km: any Perigee, km: any Tolerance ± —
Inclination, deg: any Tolerance ± —
Nodal Angle, deg: any Ephemeris Accuracy, m —
Escape dV Required, m/s —

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) —
Pointing accuracy, arc sec — Field of view, deg —
Pointing Stability (Jitter) arc sec/sec —
Special Restrictions (Avoidance) —

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	3000	—
Standby	—	—
Peak	—	—

☒ Continuous

Voltage, V: 28 Frequency, Hz: —

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other —
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) — Frequency (MHZ) —
☐ On-Board Data Processing Required
Description —

Data Types: ☐ Analog ☒ Digital ☒ Hrs/Day: 24
Film (Amount): TBD Voice (Hrs/Day): TBD
Live TV (Hrs/Day): TBD Other —
On-Board Storage (MBIT): TBD
Data Dump Frequency (Per Orbit): TBD
Recording Rate (KBPS): 5000 Downlink Frequency (MHZ) —

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	3000	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

VOL. 13 m^3

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 3200

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 10 Task Assignment Test Subjects

Skills (See Table B)

SKILL	2					
LEVEL	1					
Hrs/Day	30					

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

Crew requirements include special diets, procedures, tests and analyses.

PAYLOAD ELEMENT NAME
Biolab

CODE
GRUM 0154

CONTACT

Name Dr. Ron White
Address MATSCO
1050 Bay Area Blvd.
Houston, TX 77258

Telephone 713-488-9005

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1990
No. of flights 9
Duration of Flight, days 180

OBJECTIVE

Provide a facility for investigating animal and plant development and reproduction in the absence of gravity as well as other physiological systems such as the vestibular system which are affected by space flight.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 4

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

DESCRIPTION

A biological laboratory in a pressurized shirt sleeve environment with the equipment necessary to conduct animal and/or plant research in growth, reproduction, radiation effects, vestibular function, etc. Facilities will include animal and plant holding units with equipment supporting specimen observation, sacrifice, dissection, preservation, and centrifugation. Specialized equipment may be required for radiation studies, vestibular experiments, etc.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -
Inclination, deg any Tolerance ± -
Nodal Angle, deg any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known)
Pointing accuracy, arc sec Field of view, deg
Pointing Stability (Jitter) arc sec/sec
Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day	
Operating	2000		
Standby			☒ Continuous
Peak			

Voltage, V 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☒ Digital ☒ Hrs/Day 24
Film (Amount) TBD Voice (Hrs/Day) TBD
Live TV (Hrs/Day) TBD Other
On-Board Storage (MBIT) TBD
Data Dump Frequency (Per Orbit) TBD
Recording Rate (KBPS) 5000 Downlink Frequency (MHZ)

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	2000	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

Vol 13 m^3

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 3000

Consumables Types ____

Acceleration sensitivity, g min ____ max 10^{-4}

CREW REQUIREMENTS

Crew Size 2 Task Assignment Animal and Plant Experiments

Skills (See Table B)

SKILL	2					
LEVEL	1					
Hrs/Day	7					

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
Medical Operations

CODE
GRUM 0155

CONTACT

Name Dr. Ron White
Address MATSCO
1050 Bay Area Blvd.
Houston, TX 77258

Telephone 713-488-9005

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1992
No. of flights 3
Duration of Flight, days 30

OBJECTIVE

Develop a facility to provide health care maintenance for the crew on long duration missions. Medical-surgical conditions may be work related, non-work related, unique to space flight or psychologically related to the remote environment.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 4

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 10

DESCRIPTION

Medical facilities will be developed in stages from an augmented orbiter capability with the crew trained in first-aid to a dedicated laboratory facility resembling an emergency room with a medical research staff. The mission categorized here is an interim stage with dedicated first-aid and exercise areas and equipment and supplies necessary to care for the medical problems of the crew over a one month period and animal holding units for large primates. Fluid infusion equipment will be evaluated.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -
Inclination, deg any Tolerance ± -
Nodal Angle, deg any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known)
Pointing accuracy, arc sec Field of view, deg
Pointing Stability (Jitter) arc sec/sec
Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day	
Operating	500		
Standby			☐ Continuous
Peak			

Voltage, V 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☒ Digital ☒ Hrs/Day 8
Film (Amount) TBD Voice (Hrs/Day) TBD
Live TV (Hrs/Day) TBD Other
On-Board Storage (MBIT)
Data Dump Frequency (Per Orbit)
Recording Rate (KBPS) 5000 Downlink Frequency (MHZ)

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	500	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

Vol 3 m^3 L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 500

Consumables Types MEDICAL SUPPLIES

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 4 Task Assignment Test Subjects and Experimenters

Skills (See Table B)

SKILL	2	2				
LEVEL	1	3				
Hrs/Day						

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

Crew requirements include special diets, procedures, tests and analyses.

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PAYLOAD ELEMENT NAME
Vacuum Vapor Deposition Studies

CODE
GRUM0175

CONTACT

Name R. T. Frost
Address GE Space Division
Box 8555
Philadelphia, PA 19101

Telephone (215) 962-3517

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1933
No. of flights 3
Duration of Flight, days 300

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 5

OBJECTIVE

Exploration of new technology for deposition of thin semiconductor films in ultra high vacuum exploiting extreme pumping rates of space vacuum to allow significant evaporation and deposition rates. Improved purity, freedom from defects, carrier lifetime and mobility.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 10

DESCRIPTION

Wake-shield ultra vacuum evaporation and deposition facility, including provisions for out-gassing shield, deployment and heating of evaporant sources of semiconductors and dopant elements, deployment and instrumentation of substrates, mass spectrometric measurements of vacuum trace species, provisions for vacuum storage or protective coating of deposited films, and measurement of evaporation and deposition rates.

ORBIT CHARACTERISTICS

Apogee, km ≥ 200 Perigee, km ≥ 200 Tolerance ± _____

Inclination, deg any Tolerance ± _____

Nodal Angle, deg any Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	5,000	24
Standby	1,000	24
Peak	25,000	24 hrs during outgas

☐ Continuous

Voltage, V 220/440 Frequency, Hz 60 - 400

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☒ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☒ On-Board Data Processing Required

Description
Microprocessor for interpretation of mass spectrometer & monitor outputs

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day 24

Film (Amount) 5 frames/day Voice (Hrs/Day) 8

Live TV (Hrs/Day) 1 Other _____

On-Board Storage (MBIT) 25 MBIT

Data Dump Frequency (Per Orbit) once per day

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) 5 MHz

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	- 20	max	+50 (shield)
	non-operational min	outgas	max	350°C (shield)
Heat Rejection, w	operational min	1,000	max	5,000
	non-operational min	passive, 25,000	max	passive, 25,000

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m dia. 5 W, m ____ H,m 1/2 Stowed

L,m dia. 5 W,m ____ H,m 2 Deployed

Launch mass, kg 1000

Consumables Types Inert gas

Acceleration sensitivity, g min 10^{-4} max 1

CREW REQUIREMENTS

Crew Size 2 Task Assignment ____

Skills (See Table B)

SKILL	3	5					
LEVEL	3	2					
Hrs/Day	8	8					

EVA ☒ YES ☐ NO Reason service shield Hrs/EVA 1

SERVICING/MAINTENANCE

SERVICE: Interval, days 10 Consumables, kg 11

Returnables, kg 10 Man Hours 16

CONFIGURATION CHANGES: Interval, days 20 Man/Hrs. Req. 16

Deliverables, kg - Returnables, kg -

SPECIAL CONSIDERATIONS/See Instructions

Shield must be outgassed after each astronaut service/config. change. Specimen substrates must be stored in inert gas containers before and after deposition. Shield facility operations control room located in space station in location allowing convenient EVA to co-orbiting or tethered wake shield. Facility should be accompanied by on-board simple metallurgical laborator. Consumables each 10 days include 1 kg inert gas plus 10 kg raw materials.

V83-0165-408(T)

PAYLOAD ELEMENT NAME Chemical Reaction Studies

CODE GRUM0176

CONTACT

Name R. T. Frost
Address GE Space Division
Box 8555
Philadelphia, PA 19101

Telephone (215) 962-3517

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1991
No. of flights 3
Duration of Flight, days 300

OBJECTIVE

Measurement of reaction rates and formation of ultrapure compounds by containerless techniques. Formation of compounds of highly reactive and refractory materials, including single crystals.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 5

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION

Containerless processing facility using electromagnetic fields, providing heating and melting by induction or laser. Precision control of vacuum and reactive gas environments, remote manipulation of specimens, pyrometric instrumentation, laser fluorescence studies of vaporization and gas-surface reactions.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± _____
Inclination, deg any Tolerance ± _____
Nodal Angle, deg any Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	5,000	7
Standby	1,000	16
Peak	10,000	1

☐ Continuous

Voltage, V 220 Frequency, Hz 60 or 400

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☒ On-Board Data Processing Required
Description Microprocessor for analysis of experiment data and experiment control

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day 8
Film (Amount) 100 frames/day Voice (Hrs/Day) 6
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) 25 MBIT
Data Dump Frequency (Per Orbit) once per day
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) 5 MHz

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational	min 15	max 25
	non-operational	min 2	max 50
Heat Rejection, w	operational	min 5,000	max 10,000
	non-operational	min 1,000	max 1,000

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m 3 W,m 1 H,m 2 Deployed

Launch mass, kg 1500

Consumables Types Inert gas, hydrogen

Acceleration sensitivity, g min 10^{-4} max 10^{-3}

CREW REQUIREMENTS

Crew Size 2 Task Assignment ____

Skills (See Table B)

SKILL	3	5				
LEVEL	3	2				
Hrs/Day	4	8				

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days 50 Consumables, kg 15

Returnables, kg 5 Man Hours 48

CONFIGURATION CHANGES: Interval, days 10 Man/Hrs. Req. 16

Deliverables, kg -- Returnables, kg --

SPECIAL CONSIDERATIONS/See Instructions

Facility should be accompanied by a small on-board metallurgical/chem. lab.

Consumables each 50 days include 10 kg inert gas plus 5 kg raw materials.

III/1/IV

PAYLOAD ELEMENT NAME — **CODE**

Undercooled Solidification Studies — GRUM 0177

CONTACT

Name R. T. Frost
Address GE Space Division
Box 8555
Philadelphia, PA 19101

Telephone (215) 962-3517

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1991
No. of flights 3
Duration of Flight, days 100

OBJECTIVE

Studies of nucleation in undercooled melts, investigation of new metastable phases produced by undercooled solidification, production of bulk metallic glasses.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 5

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION

Experiment facility to provide containerless positioning of material specimens by electromagnetic or acoustic fields, heating by induction, resistance furnace or optical (including laser) means, optical and infrared pyrometer measurement of specimen temperature, provisions for gas reactions to specimen surface, high speed pyrometry for detailed measurement of recalescence dynamics, specimen exchanger for repeated runs with different materials, specimen anti-contaminant provisions.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± _____

Inclination, deg any Tolerance ± _____

Nodal Angle, deg any Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	3,000	7
Standby	1,000	16
Peak	5,000	1

☐ Continuous

Voltage, V 110/220 Frequency, Hz 60

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☒ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☒ On-Board Data Processing Required

Description
Single buffer-stored images of hot specimen, temperatures, pressures, etc.

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day 8

Film (Amount) 100 frames/day Voice (Hrs/Day) 6

Live TV (Hrs/Day) 1 hour/day Other _____

On-Board Storage (MBIT) 25 MBIT

Data Dump Frequency (Per Orbit) once per day

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) 5 MHz

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	15	max	25
	non-operational min	2	max	50
Heat Rejection, w	operational min	3,000	max	5,000
	non-operational min	1,000	max	1,000

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m ___	W, m ___	H,m ___		Stowed
L,m 2	W,m 1	H,m 2		Deployed

Launch mass, kg 1500

Consumables Types Inert gas

Acceleration sensitivity, g min 10^{-5} max 10^{-4}

CREW REQUIREMENTS

Crew Size 2 Task Assignment ___

Skills (See Table B)

SKILL	3	5				
LEVEL	3	2				
Hrs/Day	4	8				

EVA ☐ YES ☒ NO Reason ___ Hrs/EVA ___

SERVICING/MAINTENANCE

SERVICE: Interval, days 50 Consumables, kg 15

Returnables, kg 5 Man Hours 48

CONFIGURATION CHANGES: Interval, days 10 Man/Hrs. Req. 16

Deliverables, kg -- Returnables, kg --

SPECIAL CONSIDERATIONS/See Instructions

This facility should be accompanied by a small on-board metallurgical lab, consisting of cutting, etching, polishing, photomicrography, etc.

Consumables each 50 days include 10 kg inert gas plus 5 kg raw materials.

PAYLOAD ELEMENT NAME Thermophysical Measurements

CODE GRUM 0178

CONTACT

Name R. T. Frost
Address GE Space Division
Box 8555
Philadelphia, PA 19101

Telephone (215) 962-3517

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1991
No. of flights 3
Duration of Flight, days 300

OBJECTIVE

Determination of high temperature values of specific heat, viscosity, thermal conductivity and vapor pressure for a number of materials of scientific and technical importance.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 5

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

DESCRIPTION

High temperature measurements facility to provide electromagnetic containerless positioning, electron beam or eddy current heating and melting, pyrometric measurements of temperature, bolometric measurements of emitted enthalpy, total enthalpy by gulp calorimetry, and measurements of vapor pressure, surface tension and viscosity by special instrumentation. Facility can provide vacuum or high pressure inert gas environment.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± _____
Inclination, deg any Tolerance ± _____
Nodal Angle, deg any Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2,000	7
Standby	1,000	16
Peak	25,000	1

☐ Continuous

Voltage, V 220/440 Frequency, Hz 60 - 400

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other – _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☒ On-Board Data Processing Required

Description
Single buffer-stored images of hot specimen, temperatures, pressure, etc.

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day 24
Film (Amount) 100 frames/day Voice (Hrs/Day) 6
Live TV (Hrs/Day) 1 hour/day Other _____
On-Board Storage (MBIT) 25 MBIT
Data Dump Frequency (Per Orbit) once per day
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) 5 MHz

V83-0165-408(T)

11/1/11

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	10° C	max	30° C
	non-operational min	2° C	max	50° C
Heat Rejection, w	operational min	2 kw	max	25 kw
	non-operational min	1 kw	max	1 kw

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m 3 W,m 2 H,m 2 Deployed

Launch mass, kg 1500

Consumables Types Inert gas

Acceleration sensitivity, g min 10^{-5} max 10^{-3}

CREW REQUIREMENTS

Crew Size 2 Task Assignment ____

Skills (See Table B)

SKILL	3	5				
LEVEL	3	2				
Hrs/Day	8	8				

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days 30 Consumables, kg 50

Returnables, kg 5 Man Hours 24

CONFIGURATION CHANGES: Interval, days 5 Man/Hrs. Req. 8

Deliverables, kg -- Returnables, kg --

SPECIAL CONSIDERATIONS/See Instructions

When operated in the vacuum specimen environment mode, space vacuum of 10^{-4} torr (10 PA) is required for venting vacion pumps.

Attachment of module at remote end of space station might be considered to enhance safety due to high powers and high specimen temperatures involved.

Consumables each 30 days include 45 kg inert gas plus 5 kg raw materials.

V83-0165-408(T)

PAYLOAD ELEMENT NAME
SHUTTLE IR TELESCOPE FACILITY

CODE
GRUM0201

CONTACT

Name L. Young
Address ARC

Telephone (415) 965-6546

REFERENCES

2, No. S-15
3, A-1
5,
6, P-11
9, 2-2

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 88 (2)
No. of flights ———
Duration of Flight, days 10 year life

OBJECTIVE The Shuttle Infrared Telescope Facility (SIRTF) is an astronomical telescope capable of accomodating photometric, spectroscopic & polarimetric instruments. Typical studies include the cold regions of space where dust & gas are condensing into stars, solar system objects (e.g., planetary, atmospheres, comets) & IR emitting extragalactic objects.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 6

DESCRIPTION The SIRTF telescope will have an 0.85-m-diameter aperture & will be cooled to below 20°K using cryogenic helium (open cycle). A radiatively cooled aperture shade will reduce the heat load into the aperture & will allow viewing to within 45° of the sun & earth. An integral aperture cover protects the telescope interior during ground handling, launch, & recovery. External cryogen tanks will provide cooling for the main telescope & for some instruments. Expended cryogen may be exhausted into the telescope barrel to sweep atmospheric constituents away from the cooled surfaces. Two to six instruments will be housed at the focal plane & the telescope beam will be directed to each on command.

III/1/IV

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ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____

Inclination, deg 28.5-57° (No Pref.) Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____ Aspect ACC. 0.01 SEC

Pointing accuracy, arc sec <1 SEC INT. Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec 0.25 RMS INT.

Special Restrictions (Avoidance) 60° around hot objects (Earth Moon) 90° around SUN

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	1100		
Standby			☐ Continuous
Peak	2300		

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

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11/1/84

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational min		max	
	non-operational min		max	
Heat Rejection, w	operational min		max	800
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 8.67 W, m 4.0 H,m 4.0 Stowed

L,m ——— W,m ——— H,m ——— Deployed

Launch mass, kg 5300

Consumables Types Cryo Helium

Acceleration sensitivity, g min ——— max ———

CREW REQUIREMENTS

Crew Size ——— Task Assignment ———

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason ——— ——— Hrs/EVA ———

SERVICING/MAINTENANCE Replenish Cryogens

SERVICE: Interval, days 6 Months Consumables, kg ———

Returnables, kg ——— Man Hours ———

CONFIGURATION CHANGES: Interval, days ——— Man/Hrs. Req. ———

Deliverables, kg ——— Returnables, kg ———

SPECIAL CONSIDERATIONS/See Instructions

- Ability to aquire & track fast-moving objects at rate of 2 Arc Sec/Sec, 0.1 Arc Sec accuracy
- Provide uniterrupted power & thermal control at any pointing orientation for several days duration
- Cryogenic optics susceptible to contamination
- Minimize time in sunlight & radiation dose

V83-0165-408(T)

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PAYLOAD ELEMENT NAME
STARLAB

CODE
GRUM0202

CONTACT

Name
Address

Telephone

REFERENCES
2, No. S-16
3, A-13
5
6, P-10
9, 2-3

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS
- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 1989
No. of flights
Duration of Flight, days 10 year life

OBJECTIVE Starlab is a facility for astronomical observations in the visual and ultraviolet portion of the spectrum. Scientific investigations that can be conducted include high resolution, wide field imaging, far ultraviolet spectroscopy, precise spectrophotometry & polarimetry, & synoptic planetary observations.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 8

DESCRIPTION The Starlab facility consists of a 1-m-aperture, f/15 modified Ritchey-Chretien telescope, followed by instrument selector, which gives access either to the conventional Cassegrain focus or to a radial focal plane. Starlab will consist of two major sections, the telescope & the instrument bay, which are joined at a central structural ring. The complete Starlab is attached to the top plate of the IPS provided by the European Space Agency.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) Aspect accuracy 0.01 seconds
Pointing accuracy, arc sec _____ Field of view, deg 1.6
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2200	
Standby		
Peak	3900	

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 4.2 + Real Time Image Downlink Frequency (MHZ) _____

V83-0165-408(T)

ORIGINAL PAGE IS OF POOR QUALITY

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max 1000
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 2 W, m 2 H,m 5 Stowed

L,m 2 W,m 2 H,m 5 Deployed

Launch mass, kg 3280

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg Nitrogen for pressurization to avoid contamination

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Avoid operations in South Atlantic anomoly

V83-0165-408(T)

II/1/IV

ORIGINAL PAGE IS OF POOR QUALITY

PAYLOAD ELEMENT NAME
ORBITING VERY LONG BASELINE INTERFEROMETER PAYLOAD

CODE
GRUM0203

CONTACT

Name / Address
R. Preston, JPL
(213) 354-6895
B. Burke, MIT
(617) 253-2572

Telephone

REFERENCES
2, No. S-29
3, A-25
5,
6, P-12
9, 2-4
10,
11, P-44

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1991
No. of flights
Duration of Flight, days 10 year life

OBJECTIVE
Provide maps of compact celestial sources with finer resolution, less ambiguity, & more efficiency than Earth-bound techniques.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION The orbiting VLBI system requires a 30 to 60-m diameter deployable parabolic antenna, which will probably employ a Cassegrain subreflector so that the receiver instrumentation can be conveniently co-located at the base of the antenna with the remainder of the spacecraft. Observations would be performed simultaneously with one or more ground antennas or another free-flyer VLBI observatory, with data from the orbital VLBI system(s) being transferred to ground site in real time.

V83-0165-408(T)

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ORBIT CHARACTERISTICS

Apogee, km 400-5000 Perigee, km 400-5000 Tolerance ± _____

Inclination, deg >45 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 0.5° Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	900	
Standby		
Peak	1400	

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 12000 Downlink Frequency (MHZ) _____

V83-0165-408(T)

III/1/IV

ORIGINAL PAGE IS OF POOR QUALITY

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 3.2 W, m 2 Dia H,m _____ Stowed
L,m 8 W,m 30-60m Dia H,m _____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____
Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____
Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Companion to Grum0312 OVLBI SAT.

V83-0165-408(T)

II/1/IV

ORIGINAL FACE IS
OF POOR QUALITY

PAYLOAD ELEMENT NAME
LG AREA MODULAR ARRAY

CODE
GRUM0204

CONTACT

Name E. Mercanti
Address GSFC

Telephone (301) 344-7697

REFERENCES

2, No. S-28
6, P-14
9, 2-7
3, A-51

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

STATUS

☐ Operational ☐ Planned
☐ Approved ☒ Candidate
☐ Opportunity

First flight, yr 95
No. of flights ———
Duration of Flight, days 2 years plus with resupply

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

OBJECTIVE The primary objective of the Large Modular Array X-Ray Telescope (LAMAXT) Mission is to conduct a full-sky survey for x-ray sources, with at least as much sensitivity as the Einstein Observatory has provided for very limited areas. Additional objectives are observations of extended diffuse sources and of faint time variable objects.

DESCRIPTION The spacecraft will consist of an instrument module plus the spacecraft bus. Because of the large instrument size and weight, the instrument module will be the major structural element in the system. It will support the instruments, the spacecraft bus, the solar arrays, and the antennas.

V83-0165-408(T)

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) Aspect Accuracy 1 Sec
Pointing accuracy, arc sec 5 Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	3400	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 125 Downlink Frequency (MHZ) _____

V83-0165-408(T)

III/1/IV
ORIGINAL PAGE IS OF POOR QUALITY

THERMAL

☐ Active ☒ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m 3.4 W,m 4.4 DIA H,m ____ Deployed

Launch mass, kg 9516

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg Xenon-Methane 5 L/HR

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Avoid South Atlantic Anomoly

V83-0165-408(T)

PAYLOAD ELEMENT NAME HRS **CODE**

HIGH RESOLUTION X-RAY & γ-RAY SPECTROMETER GRUMO205

CONTACT

Name

Address

Telephone

REFERENCES

3, A-50

6, P-15

9, 2-6

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 94

No. of flights ———

Duration of Flight, days ———

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10 5

OBJECTIVE A gamma ray telescope system with high spectral resolution will be developed to investigate the information about nucleosynthesis in the Galaxy contained in narrow gamma ray lines of naturally radioactive elements.

DESCRIPTION A High Resolution of X-ray and Gamma-ray Spectrometer (HRS) could be operated from an unmanned Space Platform. It might also be accommodated in an attached mode to the Space Station.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km not critical Tolerance ± _____

Inclination, deg <45 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) Aspect Acc. 1 Sec

Pointing accuracy, arc sec 30 Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	530	
Standby		
Peak	830	

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 30 Downlink Frequency (MHZ) _____

V83-0165-108(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m 1.5 W, m 0.65 H,m 0.65 Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1768

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE CRYO REPLENISHMENT (Ar & CO_2) ≈ 45 days

SERVICE: Interval, days _____ Consumables, kg _____
Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____
Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Avoid South Atlantic Anomaly

V83-0165-408(T)

PAYLOAD ELEMENT NAME GAMMA-RAY TRANSIENT EXPLORER

CODE GRUM0206

CONTACT

Name W. Hibbard

Address GSFC

Telephone

REFERENCES

2, No. S-41

5

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A): 1

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 99

No. of flights

Duration of Flight, days 2 Yr Life

OBJECTIVE The Gamma-Ray Transient Explorer would be used to study the cosmic gamma-ray transients, with all-sky coverage and with very accurate positional and spectral measurements and solar flare gamma-ray transients with very accurate spectral measurements.

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10

DESCRIPTION Scientists would use data from the high resolution gamma-ray and scintillation spectrometers, the Dicke-type cameras, and the x-ray sky monitors to prepare maps of the sky that show photon energy levels or pulse heights as functions of time and sensor pointing direction for each orbit traversed. The succession of maps would be used to generate high spectral resolution charts showing gamma-ray sources, spectra, and time variations over the lifetime of the GTE.

ORBIT CHARACTERISTICS

Apogee, km 450 Perigee, km 450 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	1.5→2.0	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 10 Downlink Frequency (MHZ) _____

V83-0165-408(T)

II/1/IV
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THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 3000 f/f, use 1920

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Earth gravity stabilized.

V83-0165-408(T)

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PAYLOAD ELEMENT NAME
COSMIC RAY OBSERVATORY

CODE
GRUM0207

CONTACT

Name J. Ormes
Address GSFC

Telephone (301) 344-5798

REFERENCES

2, No. S-23
5,
6, P-16
3,

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

STATUS

☐ Operational ☐ Planned
☐ Approved ☒ Candidate
☐ Opportunity

First flight, yr 90(2)
No. of flights ———
Duration of Flight, days 2 year life

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

OBJECTIVE

Study the composition & energy spectrum of primary cosmic rays.

DESCRIPTION

The spacecraft will consist of the instrument module, a support module, and a propulsion module. Because of the large instrument size and weight, the instrument module will be the major structural element in the system. It will support the instruments, the support module, the solar arrays, and the antennas.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____
Inclination, deg 56° Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 2.0° LOCAL ZENITH Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2000	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
X-Ray Observatory

CODE
GRUM0208

CONTACT

Name J. Gitelman
Address GSFC

Telephone (301) 344-7889

REFERENCES

1, P-14
2, No. S-27
5

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1998
No. of flights ____
Duration of Flight, days ____

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ____

OBJECTIVE The X-ray Observatory mission make scientific observations with broad bandwidth x-ray instruments which are needed to resolve problems in the areas of large galactic phenomena, stellar structure and evolution, the nature of the active galaxies and cosmology.

DESCRIPTION

The XRO will have instruments with their principal axes pointing in the same viewing direction. XRO can be pointed (1 arc-min accuracy) to any area of interest in the sky. XRO will have the additional capability of being able to perform a slow roll maneuver about the view direction for the polarimeter and rotation modulation collimator (approximately 1 revolution per orbit).

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	900	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg A 2100 INST 1450 S/C BUS

Consumables Types B 1600 INST, 1450 S/C BUS

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME MAP **CODE** GRUM0209
Multichannel Astrometric Photometer

CONTACT REF. 6, p-83

Name
Address

Telephone

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 2000
No. of flights ____
Duration of Flight, days ____

OBJECTIVE

Determine the origin & evolution of our solar system by conducting a statistically meaningful survey of other planetary systems.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) ____

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 7

DESCRIPTION

A 1-m diameter parabolic primary mirror telescope with an 8 ft. focal length. The main structure is thermally self compensating steel-aluminum truss. The detector is four passively cooled 540 x 540 CCD arrays and one photo multiplier tube located at the prime focus.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 5-600 Perigee, km 5-600 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 0.2 min. Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec 0.2 min for 1 hr.
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2 KW	
Standby		
Peak	3 KW	

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 13 W, m 3 dia. H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 2000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days 5 yr. Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

10 hours of observation per target (could be split into 1 hr. segments)

V83-0165-408(T)

60

AI/I/IV

PAYLOAD ELEMENT NAME HEAVY NUCLEI EXPLORER

CODE GRUM0210

CONTACT

Name W. Hibbard

Address GSFC

Telephone

REFERENCES

2, No. S-38

5, Astro Explorers

STATUS

☐ Operational ☐ Planned

☐ Approved ☐ Candidate

☒ Opportunity

First flight, yr 95 Life 2 yr

No. of flights

Duration of Flight, days

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

OBJECTIVE Using a combination of ionization loss rate & Cerenkov detection the Heavy Nuclei Explorer would study the charge composition of nuclei throughout the periodic table with a charge resolution of $\sigma = 0.3$ e. This would provide answers to questions regarding the origin & acceleration, of cosmic rays, which have mystified astrophysicists for the past 10 years

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10 5

DESCRIPTION INSTRUMENTS: ION Chambers
Cerenkov Counters

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____
Inclination, deg 56 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 2° LOCAL ZENITH Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	120	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 500 BPS Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 4000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165 408(T)

PAYLOAD ELEMENT NAME Solar Optical Telescope

CODE GRUM0224

CONTACT

Name

Address

Telephone

References

1, P-83
2, S-6
3, A-55
6, P-20

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) _____

STATUS

- ☐ Operational
- ☒ Approved
- ☐ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 1988

No. of flights 1 yr for 10 yr

Duration of Flight, days _____

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

OBJECTIVE Obtain high resolution data which are required to solve many fundamental problems in solar physics. These problems include the energy and mass transports in the solar atmosphere in the presence of magnetic fields, the origin and evolution of the surface magnetic fields, the nature of sunspots and prominence, and many phenomena known to occur in laboratory plasmas and believed to be present on the sun (fluxes).

DESCRIPTION A parabolic primary mirror, 1.25-m aperture f/3.6 will provide diffraction limited solar imaging in the spectral region 115 nm to 1000 nm. An articulated primary mirror actuator assembly will provide active alignment, focus, sub-arc second pointing, rastering, and up to $\pm\frac{1}{3}$ degree offset. SOT as the baseline facility, will accommodate various Science Instruments (SIs) at its focal plane.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 460 Perigee, km 460 Tolerance ± _____

Inclination, deg 57 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☒ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	6.8 KW	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 2-50

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational	min	max	
	non-operational	min	max	
Heat Rejection, w	operational	min	max	
	non-operational	min	max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 0.5 W, m 4 Dia H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 8175

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size ____ Task Assignment ____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE Yes

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

11/1/IV

PAYLOAD ELEMENT NAME ASO
ADVANCED SOLAR OBSERVATORY

CODE
GRUM0225

CONTACT

Name
Address

Telephone

REFERENCES
3, A-67
6 (20)
9, 2-9
1, P-83

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 92 (SOT '86 (2) S-6)
No. of flights
Duration of Flight, days

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

OBJECTIVE The ASO will observe the sun with much higher resolution than can be obtained from the ground and will also be providing information from shorter-than-visible wavelengths. Interactive operations will be required, so that its possible accommodation in a manned Space Station should be considered.

DESCRIPTION The payload contains the ASO facility with focal plane and co-observing instruments, a pointing system, & other integration hardware. In addition to Solar Optical Telescope the ASO will have telescopes for hard X-ray imaging at high resolution (Pinhole/Occulter Facility, P/OF), for imaging soft X-ray (Solar Soft X-ray Telescope Facility, SSXRT), and an Extreme UV Telescope Facility (XUVTF).

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400-460 Perigee, km 400-460 Tolerance ± _____

Inclination, deg 57, Prefer Polar Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☒ Solar ☐ Earth

Truth Sites (if known) Aspect acc. 0.005 sec

Pointing accuracy, arc sec 0.01 Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	4095	Orbit day(60 min typ.)
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 42,000 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 8.1 W, m 3.8 Dia H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 12,500

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

- Developed from solar optical telescope GRUM0224.
- Maximize time in sunlight.

V83-0165-408(T)

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PAYLOAD ELEMENT NAME
Solar Terrestrial Observatory

CODE
GRUM0226

CONTACT

Name Dr. George Bethke
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone

References
2, S-24
3, D-57
9, 2-19
4,

TYPE
- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1997
No. of flights 2
Duration of Flight, days 1800

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 9

OBJECTIVE
Conduct long-term coordinated studies of coupling between the sun, solar wind, magnetosphere, ionosphere, and earth atmosphere. Also observe solar features and earth atmosphere including limb scans.

DESCRIPTION
Consists of experiment platform containing instruments and other support functions. Experiments include solar telescope, earth atmosphere remote sensors, and particle and field sensors, and particle and wave injectors. May of these instruments must be separately pointed and controlled. Sub-satellites will be used for contamination-free and some solar wind measurements.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 450 Perigee, km 450 Tolerance ± 50 - 50
Inclination, deg 57 Tolerance ± 15° - 15°
Nodal Angle, deg ____ Ephemeris Accuracy, m ____
Escape dV Required, m/s ____

POINTING/ORIENTATION

View direction ☐ Celestial ☒ Solar ☒ Earth
Truth Sites (if known) ____
Pointing accuracy, arc sec 0.5 to 3600 Field of view, deg ____
Pointing Stability (Jitter) arc sec/sec 0.1
Special Restrictions (Avoidance) ____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	3225	23
Standby	____	____
Peak	12000	1

☐ Continuous

Voltage, V 28 Frequency, Hz ____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other Realtime during some high data periods.
☐ Encryption/Decryption Required
☒ Uplink Req.: Command Rate (KBS) ____ Frequency (MHZ) ____
☒ On-Board Data Processing Required
Description Computer for sequencing and data handling. Microcomputers for experiments.

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day ____
Film (Amount) 0 Voice (Hrs/Day) ____
Live TV (Hrs/Day) ____ Other ____
On-Board Storage (MBIT) 10000
Data Dump Frequency (Per Orbit) 1
Recording Rate (KBPS) 50-12000 Downlink Frequency (MHZ) Ku-band

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min		max	
	non-operational min		max	
Heat Rejection, w	operational min	3223	max	12000
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 14.9 W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 14700(9)

Consumables Types 1900 (subsatellites and probes)

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Monitor and control

Skills (See Table B)

SKILL	3					
LEVEL	3					
Hrs/Day	6					

EVA ☒ YES ☐ NO Reason Repair/Maintenance Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

The many field and particle measurements require a clean electromagnetic environment. Some solar measurements require high pointing accuracy and stability.

PAYLOAD ELEMENT NAME (RRP)
RENEWABLE RESOURCES PAYLOAD

CODE
GRUM0227

CONTACT

Name
Address

Telephone

REFERENCES

2, No. R-6 (ALOS)
6, P53-64
9, 2-13 & 14

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 94 Life Min 2 yr → 5 yr
No. of flights
Duration of Flight, days

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10

OBJECTIVE Increase the fundamental understanding of the biophysical and biochemical processes which affect remotely-sensed spectral signatures of vegetation features of interest on the land surface of the earth, in order to better interpret and utilize remotely-sensed data for the solution of food and fibre resource problems.

DESCRIPTION INST: Two Multispectral Linear Array (MLA) Sensor (RI-20), Imaging Radiometer, Radar Altimeter, Multispectal Imaging System, Synthetic Aperature Radar, Multispectral Sensor, Active Radar (15 m dia ant.), Multichannel Passive Microwave Radiometers (4 m & 15 m dia Antennae)

V83-0165-408(T)

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ORBIT CHARACTERISTICS LOW ORBIT POSSIBLE: SUN SYNC

Apogee, km 705 Perigee, km 705 Tolerance ± _____

Inclination, deg 60° → Polar Desired Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION ± 45° OFF-NADIR

View direction ☐ Celestial ☐ Solar ☒ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 1° Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec 0.1°

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	1600	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 2.5 MBPS Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 5400

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

REVISIT 2 DAYS

SERVICE: Interval, days _____ Consumables, kg Replenish Cryogen

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

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PAYLOAD ELEMENT NAME (GP)
GEOLOGY PAYLOAD

CODE
GRUMO228

CONTACT

Name K.J. Ando
Address NASA HQ Code ER-2

Telephone 775-1201

REFERENCES
6, P-64

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☐ Opportunity

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

First flight, yr 95
No. of flights ____
Duration of Flight, days ____

OBJECTIVE The goal of geology is to acquire sufficient information on composition, structure, and chronology to reconstruct the geologic evolution of an area.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ____

DESCRIPTION
INST:

- o Multifrequency/Multipolarization/Multiple Look Angle Synthetic Aperture Radar
- o Multispectral Programmable Imaging Spectrometer
- o Thermal IR Multispectral Scanner
- o Scanning Laser Altimeter
- o Polar Subsurface Sounder
- o Active Fluorescence Spectrometer
- o Luminescence Detector

V83-0165-408(T)

ORBIT CHARACTERISTICS SEASONAL GROUND TRACK REPEAT CYCLE, SUN SYNCHRONOUS (lower possible)

Apogee, km 705 Perigee, km 705 Tolerance ± _____

Inclination, deg POLAR Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 6 Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec 0.4

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	10,000	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 300 Downlink Frequency (MHZ) _____

V83-0165-408(T)

ORIGINAL PAGE IS OF POOR QUALITY

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Each mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE REPAIR & CHANGEOUT OF INSTRUMENTS

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Major Susceptibilities: RFI at radar Frequencies
Contaminants (particulate, gaseous, condensates) on optical surface
Scattered light into optical instruments

V83-0165-408(T)

(SPACEBORNE GEODYNAMICS RANGING SYSTEM)

PAYLOAD ELEMENT NAME Crustal Dynamics Studies

CODE GRUM0229

CONTACT

Name James Murphy

Address NASA Hdqts
Code ERG-2

Telephone 755-3848

REFERENCES

6, P-67
2, R-5

STATUS Ref 2

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 1990

No. of flights ____

Duration of Flight, days ____

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

OBJECTIVE Measurements of crustal deformations can provide information on stresses within the earth, the interior rheology, & subsurface structure. Within the context of tectonic plate theory, they provide information on the driving mechanisms for plate motions & assessing plate rigidity. On a regional scale, geodetic measurements can provide information on the accumulation of strain in seismically-active regions. Geodetic measurements provide information on spatial and temporal patterns ranging from several months to decades.

DESCRIPTION The Spaceborne Laser Ranging System consists of a pulsed laser distance measurement system that sequentially measures the distance to a number of retroreflector arrays on the ground. From orbit, the laser measures the range to the corner reflectors on the earth's surface as it passes overhead.

The proposed laser system would consist of a Nd YAG laser with a 0.2 nanosecond pulse length and a repetition rate of 10 pulses/sec.

V83-0165-408(T)

ORIGINAL PAGE IS
OF POOR QUALITY

ORBIT CHARACTERISTICS

Apogee, km 45° Perigee, km 45° Tolerance ± _____
Inclination, deg 50° Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 1 arc min Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec 2 arc sec/min
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	500	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 10 KBPS Downlink Frequency (MHZ) _____

V83-0165-408(T)

II/1/IV
80

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min ____ max ____
non-operational min ____ max ____

Heat Rejection, w — operational min ____ max ____
non-operational min ____ max ____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m 2.5 W, m 1.5 H,m 1.5 Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 185

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size ____ Task Assignment ____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE Replace Laser

SERVICE: Interval, days ____ Consumables, kg ____
Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____
Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
Auroral Manned Observation Platform

CODE
GRUM 0230

CONTACT

Name Mark Sistilli
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-2017

References
3, D-14

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

First flight, yr 1990
No. of flights 1
Duration of Flight, days 6 months-1 year

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

OBJECTIVE The mission objective is to provide both broad view observation of night side auroral phenomena and selected detailed examination of various auroral features. This observation experiment, utilizing a trained auroral scientist's on-orbit selection of phenomenon to be studied. Should yield science results heretofore not possible with unmanned free-flyers.

DESCRIPTION The experiment package,along with the dedicated payload specialist, will be taken to the space station via the STS. The external experiment portion, consisting of a remotely steerable array of film cameras/imaging systems, will be installed, calibrated, and serviced (film changes) via EVA. The internal portion, consisting of an optical alignment system for the cameras/imaging system will be located at a space station optical viewing port (with unobstructed earth view). The scientist will also be provided access to selected realtime science telemetry from the OPEN satellites to enhance observation selection (optional).

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± -

Inclination, deg 65 - 90 Tolerance ± -

Nodal Angle, deg ____ Ephemeris Accuracy, m ____

Escape dV Required, m/s ____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth

Truth Sites (if known) ____

Pointing accuracy, arc sec ____ Field of view, deg ____

Pointing Stability (Jitter) arc sec/sec ____

Special Restrictions (Avoidance) Optical viewing port and external package both should have unobstructed earth views.

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	1000	6
Standby	100	18
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz ____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other ____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) ____ Frequency (MHZ) ____

☒ On-Board Data Processing Required

Description Sensor image display/storage

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day ____

Film (Amount) ____ Voice (Hrs/Day) ____

Live TV (Hrs/Day) 6 Other ____

On-Board Storage (MBIT) ____

Data Dump Frequency (Per Orbit) ____

Recording Rate (KBPS) ____ Downlink Frequency (MHZ) ____

V83-0165-408(T)

11/1/IV

THERMAL

☐ Active ☒ Passive

Temperature, deg C	operational	min		max
	non-operational	min		max
Heat Rejection, w	operational	min	1000	max 1000
	non-operational	min	100	max 100

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☒ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg ____

Consumables Types camera film

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Preparation, observation, interpretation

Skills (See Table B)

SKILL	3					
LEVEL	3					
Hrs/Day	12					

EVA ☒ YES ☐ NO Reason Installation/ servicing Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days 30 Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

GE03

PAYLOAD ELEMENT NAME Soil and Snow Research and Assessment

CODE GRUM 0232

CONTACT

Name Dr. Thomas Karras

Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-4658

REFERENCES
2, R-10

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1990
No. of flights 1
Duration of Flight, days 720-1080

OBJECTIVE

Synoptic and repetitive measurements of moisture content for agriculture, water resources and climate information.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

DESCRIPTION

Instrument includes a passive microwave radiometer. Bandwidth 1.4 - 1.427 GHz, 12 km. Resolution element, swath width: 87 km.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 465 km Perigee, km 465 km Tolerance ± -
Inclination, deg ≥ 60° Tolerance ± -
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 360 Field of view, deg 5
Pointing Stability (Jitter) arc sec/sec 5
Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	1200	6
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description Data rates - 40 Mbs

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

II/I/IV

86

THERMAL

☐ Active ☒ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min 1200 max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 550

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Monitor

Skills (See Table B)

SKILL	5					
LEVEL	2					
Hrs/Day	1					

EVA ☒ YES ☐ NO Reason 10 x 10 m antenna assembled in orbit Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

II/1/IV

87

PAYLOAD ELEMENT NAME: Advanced Thermal Mapping Applications

CODE: GRUM 0233

CONTACT

Name: Dr. Thomas Karras
Address: GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone: 215-962-4658

REFERENCES

2, R-7

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr: 1990
No. of flights: 1
Duration of Flight, days: 360

OBJECTIVE

Thermal infrared resource surveys in geology, geophysics, agriculture, forestry, land use and water resources

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A): 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 6

DESCRIPTION

High resolution IR radiometer in 8-15 micrometers spectral region, 40-60 nm bandwidth. 100-150 m resolution element.

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± –
Inclination, deg > 55 Tolerance ± –
Nodal Angle, deg ____ Ephemeris Accuracy, m ____
Escape dV Required, m/s ____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) ____
Pointing accuracy, arc sec 3600 Field of view, deg 10
Pointing Stability (Jitter) arc sec/sec 360
Special Restrictions (Avoidance) ____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	100	
Standby		
Peak		

☒ Continuous

Voltage, V 28 Frequency, Hz ____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other ____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) ____ Frequency (MHZ) ____
☐ On-Board Data Processing Required
Description Data rates - 2.5 Mb/s

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day ____
Film (Amount) ____ Voice (Hrs/Day) ____
Live TV (Hrs/Day) ____ Other ____
On-Board Storage (MBIT) ____
Data Dump Frequency (Per Orbit) ____
Recording Rate (KBPS) ____ Downlink Frequency (MHZ) ____

AI/1/IV

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min		max	
	non-operational min		max	
Heat Rejection, w	operational min	100	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1200

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Replenish cryogenics, orbital assembly of large optics

Skills (See Table B)

SKILL	5					
LEVEL	2					
Hrs/Day	1					

EVA ☒ YES ☐ NO Reason Cryogen servicing/ orbital assembly Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

II/1/IV

90

PAYLOAD ELEMENT NAME Multidiscipline Advanced Land Observation System (ALOS, GEOLAB, AGRILAS)

CODE GRUM0234

CONTACT

Name Dr. Thomas Karras
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone (215) 962-4658

References
2, R-6 (Partial)

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 1990-1995
No. of flights 1
Duration of Flight, days 720-1080

OBJECTIVE
High resolution mapping using optical, passive and active microwave for applications in earth resources and disaster damage assessment.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 9

DESCRIPTION
- Multispectral optical imagers in the visible, IR and microwave spectral bands. 1-3 meter resolution element. Detector arrays for pushbroom scan, microwave radiometer, SAR, optical fluorescence sensor.
- Instruments similar to renewable resources 0227.

V83-0165-408(T)

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ORBIT CHARACTERISTICS

Apogee, km LEO Perigee, km LEO Tolerance ± -

Inclination, deg Sun Sync Tolerance ± -

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 6 Field of view, deg 10

Pointing Stability (Jitter) arc sec/sec 0.4

Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	6000	6
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description Data Rates - 300 Mbps

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

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E-2

11/1/IV

THERMAL

☐ Active ☒ Passive

Temperature, deg C	operational min		max	
	non-operational min		max	
Heat Rejection, w	operational min	6000	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1315

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Operate cameras, raw data assessment, target selection, changing photographic film

Skills (See Table B)

SKILL	4					
LEVEL	3					
Hrs/Day	6					

EVA ☒ YES ☐ NO Reason. In-orbit assembly of 3 x 10 m antenna/large aperture optics.

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

Quick reaction disaster monitoring.

V83-0165-408(T)

PAYLOAD ELEMENT NAME Episodic Events Detection

CODE GRUM0235

CONTACT

Name

Address

Telephone

Reference 6, P-68

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) _____

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 97

No. of flights _____

Duration of Flight, days _____

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10: 8

OBJECTIVE Initial detection and identification of the event, short and long-term monitoring of the event and its consequences, environmental impact assessment, and baseline research studies in support of the disaster.

DESCRIPTION Satellites perform a complementary role to field surveys, aircraft reconnaissance and ground data collection in obtaining information regarding disaster assessment. However, episodic events are unique in that the disaster region is frequently characterized by inaccessibility and/or poor visibility due to clouds, haze, and smoke. Space station utilization include sensors optimized for the observation of man induced and natural disasters.

Instruments - Multiband Imaging Spectrometer, Multiband Thermal IR Imager, Synthetic Aperature Radar, Passive Microwave Radiometer, Scanning Laser Altimeter, Laser Fluorometer.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____

Inclination, deg Polar Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 6 Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec 0.4

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating		
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 300 MPS Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment On B'd OBS, Inst. control, Data Anal.

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☒ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE Yes

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Instruments similiar to renewable resources GRUM0227, with the additional capability of a Bore-Sighted optical system with many sensors slaved to it. On-board capability of changing spectral & spatial resolution of instruments

Repeat ground track every 3 days.

GE02

PAYLOAD ELEMENT NAME ADVANCED EARTH RESOURCES SENSING SYSTEM

CODE GRUM0236

CONTACT

Name: Dr Thomas Karras
Address: GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone: (215) 962-4658

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr: 1990
No. of flights: 1
Duration of Flight, days: 720-1080

OBJECTIVE

Applications in agriculture, range measurement, forestry, geological resources, land use, disaster assessment, earth and ocean dynamics

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A): 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 8

DESCRIPTION

Active and passive optical and microwave sensors.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km LEO Perigee, km LEO Tolerance ± _____
Inclination, deg >55° Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 6 Field of view, deg 10
Pointing Stability (Jitter) arc sec/sec 4
Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	10,000	6
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

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11/1/IV

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational min		max	
	non-operational min		max	
Heat Rejection, w	operational min	10,000	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 200

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment ____

Skills (See Table B)

SKILL	4					
LEVEL	3					
Hrs/Day	6					

EVA ☒ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

- 15 day orbit repeat
- Similar to GRUM4000.

V83-0165-408(T)

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PAYLOAD ELEMENT NAME METEOROLOGICAL PAYLOAD

CODE GRUMO250

CONTACT

Name

Address

Telephone

REFERENCES

3, D-1
6, P-41

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 91 based on Metsat Global Coverage 2ixday

No. of flights ——

Duration of Flight, days ——

OBJECTIVE Upgrade of current operational meterological satellites

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ——

DESCRIPTION INST: Advanced Microwave Sounding Unit (AMSU), Advanced Moisture & Temp. Sounder (AMTS). Microwave Press. Sounder (MPS)

Companion to METSAT 0376

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____

Inclination, deg 98 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 6 MIN Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec 6

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	1140		
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 16. Downlink Frequency (MHZ) _____

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min ____ max ____
non-operational min ____ max ____

Heat Rejection, w — operational min ____ max ____
non-operational min ____ max ____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m 4.4 W, m 1.6 H,m 0.8 Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1170

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size ____ Task Assignment ____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____
Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____
Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

- Companion to METSAT GRUM0376.

V83-0165-408(T)

PAYLOAD ELEMENT NAME Atmospheric Research Payload

CODE GRUM0251

CONTACT

Name Dr. M. H. Bortner
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-3282

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

First flight, yr 1990
No. of flights 4-6
Duration of Flight, days 1095

OBJECTIVE

Global tropospheric studies of processes controlling the carbon/nitrogen/ozone cycle and the sulfur/ammonia/carbon/aerosol cycle including roles of transport, interaction, and removal processes as they affect polluted air. Study of radiation, chemistry and dynamics of stratorphere, mesosphere and thermosphere including coupling between regions and between processes

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

DESCRIPTION

This mission is a combination of Lower Atmospheric Research Satellite (LARS) and Upper Atmospheric Research Satellite (UARS) programs. It is expected that UARS will have flown before Space Station flight, but that more data from at least some of the instruments will be needed. Orbital parameters for LARS and UARS are similar enough to permit their using the same platform with the advantage of the coupling of data interpretation.

V83-0165-408(T)

III/1/IV

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS

Apogee, km 500 Perigee, km 500 Tolerance ± 100 - 100
Inclination, deg 64.90 PREFERRED Tolerance ± 10 - 5
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☒ Solar ☒ Earth x Earth's Limb
Truth Sites (if known) _____
Pointing accuracy, arc sec 140 Field of view, deg 6
Pointing Stability (Jitter) arc sec/sec 3
Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	2500	
Standby		
Peak		

☒ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) 1500
Data Dump Frequency (Per Orbit) 1
Recording Rate (KBPS) 300 Downlink Frequency (MHZ) _____

V83-0165-408(T)

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AT/1/11

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	-259	max	50	(1)
	non-operational min		max		
Heat Rejection, w	operational min	2500	max	2500	
	non-operational min		max		

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m 6 W,m 4 H,m 3 Deployed (2)

Launch mass, kg 3300

Consumables Types Cryogen

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size ____ Task Assignment Instrument changes, observation outside FOV, checkout, calibration

Skills (See Table B)

SKILL	3					
LEVEL	2					
Hrs/Day	TBD					

EVA ☒ YES ☐ NO Reason Instrument change and service Hrs/EVA ____ (4)

SERVICING/MAINTENANCE

SERVICE: Interval, days (3) Consumables, kg TBD (3)

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days yes Man/Hrs. Req. TBD

Deliverables, kg TBD Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

(1) One experiment requires solid hydrogen cryogen. Several different temperatures needed

(2) One 53 kg instrument on boom

(3) Determined by cryogen needs.

(4) Depends on design

V83-0165-408(T)

II/1/IV

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PAYLOAD ELEMENT NAME
Tropical Meteorological Support

CODE
GRUM 0252

CONTACT

Name Dr. M. H. Bortner
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-3282

References
6, P-77

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1994
No. of flights 1
Duration of Flight, days 1460

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

OBJECTIVE
Perform environmental measurements of equitorial belt (30N to 30S) to support global meteorological measurement to aid in climatological and weather investigations. Provide vertical profile data of atmospheric temperature, water vapor, and precipitation to aid in understanding equitorial dynamic and exchange mechanisms and their affect on global weather.

DESCRIPTION
In low inclination (28.5°) orbit, this mission uses passive microwave radiometer to measure temperature, water vapor and precipitation; scatterometer to measure wind field vectors; and pushbroom IR mapper to measure earth surface temperature. Use of scientist to override automated operation when interesting effects out of FOV are seen. The instrument complement was assumed to be AMSU, AVIIRR, SCAT and an advanced version of HIRS.

V83-0165-408(T)

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ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± 100 - 100
Inclination, deg 28.5 Tolerance ± 7 - 0
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 36 Field of view, deg 2
Pointing Stability (Jitter) arc sec/sec 36
Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	800	22
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) 10^4
Data Dump Frequency (Per Orbit) 1
Recording Rate (KBPS) 1800 Downlink Frequency (MHZ) _____

V83-0165-408(T)

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11/1/84

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	283	max	305
	non-operational min	258	max	328
Heat Rejection, w	operational min	800	max	800
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1000

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Observation outside FOV; checkout, calibration

Skills (See Table B)

SKILL	3					
LEVEL	3					
Hrs/Day	4					

EVA ☒ YES ☐ NO Reason Antenna Deployment Hrs/EVA 8

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

II/1/IV

108

ORIGINAL PAGE IS OF POOR QUALITY

PAYLOAD ELEMENT NAME
Imaging Radar Experiment (FIREX)

CODE
GRUM 0253

CONTACT

Name Dr. S. L. Neste
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-2153

References
2, E-8

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

First flight, yr 1990
No. of flights 1
Duration of Flight, days 1095

OBJECTIVE

To produce images of sea ice and oceanic features to aid determining the condition of sea shipping lanes and to provide input to long-range weather forecasting. Land images will also be obtained to provide inputs to renewable and nonrenable land resource management.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 6

DESCRIPTION

The primary payload consists of a synthetic aperture radar which can be reconfigured on-orbit by crew EVA activity. Secondary payload could consist of an altimeter and/or scatterometer or other appropriate instruments. Payload requirements which follow are based on the SAR since its requirements will be the driver.

V83-0165-408(T)

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ORBIT CHARACTERISTICS

Apogee, km 800 Perigee, km 800 Tolerance ± 100 - 100
Inclination, deg 90 Tolerance ± -
Nodal Angle, deg ____ Ephemeris Accuracy, m ____
Escape dV Required, m/s ____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) ____
Pointing accuracy, arc sec 54 Field of view, deg 10
Pointing Stability (Jitter) arc sec/sec 9
Special Restrictions (Avoidance) ____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	900	6
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz ____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☐ Offline ☐ Other ____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) ____ Frequency (MHZ) ____
☒ On-Board Data Processing Required
Description Real-time, coarse spatial resolution, SAR image processing

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day ____
Film (Amount) ____ Voice (Hrs/Day) ____
Live TV (Hrs/Day) ____ Other ____
On-Board Storage (MBIT) ____
Data Dump Frequency (Per Orbit) ____
Recording Rate (KBPS) 10,000 Downlink Frequency (MHZ) ____

V83-0165-408(T)

ORIGINAL PAGE IS OF POOR QUALITY

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational min		max	
	non-operational min		max	
Heat Rejection, w	operational min	900	max	900
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 2.2 W, m 2.2 H,m 1.5 Stowed

L,m 10.7 W,m 2.2 H,m 0.5 Deployed

Launch mass, kg 325

Consumables Types

Acceleration sensitivity, g min max

CREW REQUIREMENTS

Crew Size 1 Task Assignment Real-time data assessment

Skills (See Table B)

SKILL	4					
LEVEL	2					
Hrs/Day	1					

EVA ☒ YES ☐ NO Reason Hardware Reconfiguration Hrs/EVA

SERVICING/MAINTENANCE

SERVICE: Interval, days Consumables, kg

Returnables, kg Man Hours

CONFIGURATION CHANGES: Interval, days 100-200 Man/Hrs. Req.

Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

II/1/IV

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111

PAYLOAD ELEMENT NAME	CODE
OCEAN PAYLOAD	G R U M 0 2 5 4

CONTACT

Name

Address

Telephone

REFERENCES

3, D-7
6, P29-41
2, E-6

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

STATUS

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 91
No. of flights
Duration of Flight, days

Life 3 YR + with servicing

OBJECTIVE

Determine the circulation, heat content, and horizontal heat flux of the global oceans, how they are influenced by the atmosphere and how they influence climate. Determine primary productivity of the ocean, & characteristics of polar sea ice cover.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10

DESCRIPTION INST: Radar altimeter, scatterometer, ocean color imager, microwave radiometer, synthetic aperture radar, ocean microwave package (multibeam altimeter, directional wave spectrometer).

V83-0165-408(T)

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ORBIT CHARACTERISTICS

Apogee, km 300 Perigee, km 300 Tolerance ± -

Inclination, deg 65° Tolerance ± -

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____ 10 Day Repeat

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	650		
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

ORIGINAL PAGE IS OF POOR QUALITY

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 1350

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE YES (6)

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

- Companion to TOPEX GRUM0377.

V83-0165-408(T)

II/1/IV

ORIGINAL PAGE IS OF POOR QUALITY

PAYLOAD ELEMENT NAME Lidar Measurement of Air Quality

CODE GRUM 0232

CONTACT

Name Dr. GeorgeBethke
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-4432

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1989
No. of flights 1
Duration of Flight, days 1800

OBJECTIVE

Concentration and distribution of atmospheric trace species.

TYPE

- ☑ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

DESCRIPTION

System will be modular, with 3 or 4 laser sources and detectors, and with a central receiver telescope which may also perform as transmitter. The design will be modular, with each laser source and detector combination being used for more than one atmospheric species.

V83-0165-408(T)

II/1/IV

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ORBIT CHARACTERISTICS

Apogee, km 500 Perigee, km 500 Tolerance ± 100 - 100
Inclination, deg 75 Tolerance ± 15° - 15°
Nodal Angle, deg ____ Ephemeris Accuracy, m ____
Escape dV Required, m/s ____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) ____
Pointing accuracy, arc sec 1000 Field of view, deg 0.1
Pointing Stability (Jitter) arc sec/sec 360
Special Restrictions (Avoidance) ____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	2350-4230	24
Standby	400	
Peak		

☒ Continuous

Voltage, V ____ Frequency, Hz ____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other ____
☐ Encryption/Decryption Required
☒ Uplink Req.: Command Rate (KBS) 1 Frequency (MHZ) ____
☒ On-Board Data Processing Required
Description Data normalization, compression, and storage/discard logic

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day ____
Film (Amount) ____ Voice (Hrs/Day) ____
Live TV (Hrs/Day) ____ Other ____
On-Board Storage (MBIT) 300
Data Dump Frequency (Per Orbit) Once or twice
Recording Rate (KBPS) 500 Downlink Frequency (MHZ) ____

V83-0165-408(T)

THERMAL

☒ Active ☒ Passive

Temperature, deg C	operational min	-200	max	-190
	non-operational min		max	+ 50
Heat Rejection, w	operational min	2350	max	4230
	non-operational min	400	max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m 3 W, m 3 H,m 3 Stowed

L,m 3 W,m 3 H,m 3 Deployed

Launch mass, kg 1360-1990

Consumables Types Laser dyes, flashlamps, cryogenics

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 1 Task Assignment monitor

Skills (See Table B)

SKILL	5					
LEVEL	2					
Hrs/Day	1					

EVA ☒ YES ☐ NO Reason Maintenance Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days 12 Consumables, kg 11

Returnables, kg 10 Man Hours 5

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Space Station implementation will permit changing, replacement, and repair of modules, and replenishment of any consumables. Lasers should require the most attention.

V33-0165-408(T)

II/1/IV
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PAYLOAD ELEMENT NAME: PLANETARY SPECTROSCOPY TELESCOPE

CODE: GRUM0275

CONTACT

Name

Address

Telephone

REFERENCES
6, P-73

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 97

No. of flights

Duration of Flight, days

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10

OBJECTIVE Many of the principal molecules, atoms, & ions in planetary & cometary atmospheres have their important spectroscopic features at wavelengths shortward of 0.3 micrometers. A great deal of physical insight can be gained from spectroscopy in this spectral region, but such observations are impossible from the ground, or even from high-flying aircraft or balloons, because strong absorption due to ozone (O_3) makes earths's atmosphere opaque at wavelengths shorter than 0.3 micrometer.

DESCRIPTION

The Planetary Spectroscopy Telescope (PST) is an instrument of modest aperture (1m) optimized for spectroscopy of Solar System objects in the spectral range from approximately 0.12 to approximately 2 micrometers.

Inst: Telescope, UV Spectrograph, Imaging Monochromator/Filter Wheel

V83-0165-408(T)

ORIGINAL PAGE IS
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ORBIT CHARACTERISTICS

Apogee, km NearEarth or GEO Perigee, km _____ Tolerance ± _____
Inclination, deg No Preference Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) Track Moving Targets, Offset Pointing
Pointing accuracy, arc sec 5 Arc Sec/100 Sec Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec 5 Arc Sec/100 Sec
Special Restrictions (Avoidance) Within 20° of SUN

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	30	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 50 Downlink Frequency (MHZ) _____

11/1/IV
119

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE INSTRUMENT UPGRADING

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

OBSERVATIONS AT GIVEN ORIENTATION FOR EXTENDED DURATION (DAYS) WITHOUT THERMAL OR POWER DISRUPTION

V83-0165-408(T)

PAYLOAD ELEMENT NAME High-Resolution Infrared Spectroscopy

CODE GRUM0276

CONTACT

Name

Address

Telephone

REFERENCE 6, P-76

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 95

No. of flights

Duration of Flight, days

TYPE

- ☑ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10

OBJECTIVE Study the composition & structure of planetary atmospheres, & determine the sizes & surface compositions of small bodies (comets, asteroids, planetary satellites) in the Solar System which may be representative of the composition of the primordial solar nebula.

DESCRIPTION INST: Telescope (Modified SIRTF)
Fourier Transform Spectrometer

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km LEOorGEO Tolerance ± _____
Inclination, deg No Preference Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec 0.25 arc sec RMS
Special Restrictions (Avoidance) 20° of sun

a) Offset @ variable rate
B) Ability to acquire & track fast-moving objects @ rate of 2 arc-sec/second, 0.1 arc-sec accuracy
C) Ability to point at specific locations on extended sources

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	_____	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 8100

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg Cryogens

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Power & Thermal control for telescope for observation of several days duration

V83-0165-408(T)

PAYLOAD ELEMENT NAME ST
SPACE TELESCOPE

CODE
G R U M 0 3 0 1

CONTACT

Name
Address

Telephone

REFERENCE
2, S-3

STATUS

- ☐ Operational
- ☒ Approved
- ☐ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 85
No. of flights
Duration of Flight, days

Life 15 YR +

OBJECTIVE

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 600 Perigee, km 600 Tolerance ± -

Inclination, deg 28.8 Tolerance ± -

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2,100	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 11,070

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME GRO
GAMMA RAY OBSERVATORY

CODE
GRUM0302

CONTACT

Name
Address

Telephone

REFERENCES
2, No. S-9
6, P-15

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS
- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 88 Life 2 yrs. plus if serviced
No. of flights ———
Duration of Flight, days ———

OBJECTIVE The objective of the GRO is the study of the most energetic photons originating in our galaxy and beyond. These photons provide the most direct means of studying the largest transfers of energy occurring in astrophysical processes.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ———

DESCRIPTION The GRO will carry five large instruments into a 400-km circular orbit for an observation period of 2 years. The GRO will be supported by the TDRSS. A mission contractor will be chosen to develop the space segment (observatory) and the ground segment. The scientific instruments, developed by principal investigators at various institutions, will be GFE to the mission contractor. The instruments are expected to pace the system development.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____

Inclination, deg 28.5 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2000	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 11,000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE (MMS)

SERVICE: Interval, days _____ Consumables, kg _____
Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____
Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions 5 Instruments

PAYLOAD ELEMENT NAME
EXTREME ULTRAVIOLET EXPLORER

CODE
GRUM0303

CONTACT

Name
Address

Telephone

REFERENCES

2, No. S-10
5

STATUS Ref. 2

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 85 (2) 87 Life 1 yr
No. of flights ———
Duration of Flight, days ———

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technolog/ Development
- ☐ Operations

Type Number (see Table A) 1

OBJECTIVE

To perform an all-sky survey in the 100 to 1000 A region.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ———

DESCRIPTION Inst: 4 Wolter-Schwarzschild type 1 telescopes (60 cm OD). The S/C is designed to spin about the sun line, while instruments take data in the earth's shadow.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 550 Perigee, km 550 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	70	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg s/c 286, Inst 114

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME X-Ray Timing Explorer

CODE GRUMO304

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-11

5,

STATUS Ref. 2

☐ Operational ☒ Planned

☐ Approved ☐ Candidate

☐ Opportunity

First flight, yr 86 (2) 88 (7) Life 2 years

No. of flights ———

Duration of Flight, days ———

OBJECTIVE Study of temporal variability in X-Ray emitting objects

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10 ———

DESCRIPTION Inst. Large area proportional counter (LAPC) all-sky monitor (ASM) or wide field camera

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	600	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational min		max
	non-operational min		max
Heat Rejection, w	operational min		max
	non-operational min		max

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg s/c 500, inst 500

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size ____ Task Assignment ____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

Assume service every 2 yrs

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME GRAVITY PROBE B

CODE GRUM0305

CONTACT

Name

Address

Telephone

REFERENCE

2, No. S-14

STATUS Ref. 2

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 87 (2) 90 (7)

No. of flights ____

Duration of Flight, days ____

OBJECTIVE Measure the Geodetic Precession due to the motion of a Gyroscope through a gravitational field & the precession produced by the twisting of space due to the rotation of earth (relativistic spin-spin coupling)

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10 ____

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 500-600 Perigee, km 500-600 Tolerance ± _____

Inclination, deg 90 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating			
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 1530

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME ADVANCED X-RAY ASTROPHYSICS FACILITY

CODE GRUMO306

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-17

6, P-25

STATUS Ref. 2

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 90 Life 10-15 yr

No. of flights

Duration of Flight, days

OBJECTIVE

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 500 Perigee, km 500 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) Aspect accuracy 0.01 Sec.
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	600 KW	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 10,000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days 2-3 yrs Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Replace instruments & subsystems

V83-0165-408(T)

PAYLOAD ELEMENT NAME EUVSE

Extreme UV Spectroscopy Explorer

CODE GRUMO307

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-44

5

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

STATUS Ref. 2

☐ Operational ☐ Planned

☐ Approved ☐ Candidate

☒ Opportunity

First flight, yr 97 (7) Life 1 yr

No. of flights

Duration of Flight, days

OBJECTIVE

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 500 Perigee, km 500 Tolerance ± _____
Inclination, deg 28.5 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☑ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	_____	_____	
Standby	_____	_____	☐ Continuous
Peak	_____	_____	

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1600

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____
Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____
Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME X-RAY SPECTROSCOPY

CODE GRUM0308

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-39
5

STATUS Ref. 2

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 2000 (7)

No. of flights _____

Duration of Flight, days _____

OBJECTIVE To determine Red shifts, temperature, density, element abundances & ionization structure in astrophysical plasmas

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 _____

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 450 Perigee, km 450 Tolerance ± 28
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating		
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 1375

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

ORIGINAL PAGE IS
OF POOR QUALITY

PAYLOAD ELEMENT NAME Soft X-Ray Explorer

CODE GRUM0309

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-40

5,

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 2000 (7) Life 1 yr

No. of flights

Duration of Flight, days

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10

OBJECTIVE To make x-ray spectroscopy measurements to determine red shifts, temperature, density, element abundance & ionization structure in astrophysical plasma

DESCRIPTION INST. HEAO-2 TELESCOPE

The s/c will spin about the sun line. As the Earth moves around the Sun, the area examined would shift 1° /day until the celestial sphere is examined in 6 months.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400 Perigee, km 400 Tolerance ± _____
Inclination, deg 28 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	140		
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 1300

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME MOLECULAR LINE SURVEY

CODE GRUM0310

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-45
5

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

STATUS

☐ Operational ☐ Planned
☐ Approved ☐ Candidate
☒ Opportunity

First flight, yr 2000 (?) Life 3 yrs

No. of flights

Duration of Flight, days

OBJECTIVE Improve knowledge of the evolution of stars by studying molecular emissions from clouds & other stellar sources

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10

DESCRIPTION INST. 3.5m parabolic reflector & small wobbling secondary, several FIR heterodyne receivers, a bolometer receiver

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 600 Perigee, km 600 Tolerance ± _____

Inclination, deg 28.5 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 2.0 Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	200 (Inst)	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) 10^6 bits/day Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg (400 s/c) + (400 Inst) = 800

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME LDEF
LONG DURATION EXPOSURE FACILITY

CODE GRUMO311

CONTACT

Name
Address

Telephone

REFERENCES

2, No. 0I-17
6, P-17

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

STATUS

- ☐ Operational
- ☒ Approved
- ☐ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 83
No. of flights
Duration of Flight, days

OBJECTIVE

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg 57 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER NONE

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating		
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS NONE

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

11/1/IV

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 9.14 W, m 4.27 H,m 4.27 DIA Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 4500

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME OVLBI **CODE** GRUM0312

Orbiting Very Long Baseline Interferometer

CONTACT

Name Ref. 2, S-29

Address 11, P-44

Telephone

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 98

No. of flights 1

Duration of Flight, days

OBJECTIVE Radio interferometry over very long baselines provides maps of compact celestial radio sources with finer resolution, less ambiguity, and more efficiency than Earth-bound techniques.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10 3

DESCRIPTION The orbiting VLBI system requires a 30 to 60-m diameter deployable parabolic antenna, which will probably employ a Cassegrain subreflector so that the receiver instrumentation can be conveniently co-located at the base of the antenna with the remainder of the spacecraft. The subreflector would be steerable to point at various feed horns mounted at the antenna base, so that different frequency bands between 1 and 22 GHz could be covered.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400-5000 Perigee, km _____ Tolerance ± _____
Inclination, deg >45° Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	_____	_____	
Standby	_____	_____	☐ Continuous
Peak	_____	_____	

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Assembly & deployment by space station
Companion to GRUM0203 platform mounted VLBI

PAYLOAD ELEMENT NAME: SATURN ORBITER DUAL PROBE

CODE: GRUM0325

CONTACT

Name
Address

Telephone

REFERENCES

2, No. P-7

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 91

LIFE 8-12 yrs

No. of flights ____

Duration of Flight, days ____

OBJECTIVE Investigate the atmosphere, rings & magnetosphere of Saturn, the atmosphere of Titan & the surface of Titan & other satellites of Saturn

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 2

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	_____	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 2000-3600 at Saturn approach

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE ASSY. UPPER STAGE TO S/C

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

UNPP

PAYLOAD ELEMENT NAME
URANUS, NEPTUNE, PLUTO PROGRAM

CODE
GRUM0326

CONTACT

Name
Address

Telephone

REFERENCES

2, No. P-6

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 2

STATUS

☐ Operational
☐ Approved
☒ Planned
☐ Candidate
☐ Opportunity

First flight, yr 94 Life 7-20 yrs.
No. of flights ———
Duration of Flight, days ———

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 2

OBJECTIVE

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	450	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote
Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed
L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 600-1000 at op. location
Consumables Types _____
Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____
Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____
Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
Asteroid Multiple Rendezvous

CODE
GRUMO327

CONTACT

Name
Address

Telephone

REFERENCES

2. No. P-5

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

STATUS

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 96 Life 6-10 yr
No. of flights ———
Duration of Flight, days ———

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ———

OBJECTIVE

Explore 4-8 asteroids using high resolution imagery and remote sensing instruments for geochemical & geophysical measurements

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	30 KW		
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 2000 at last asteroid

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

Assy of upper stage to spacecraft

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME LPO
Lunar Polar Orbit

CODE
GRUMO328

CONTACT

Name
Address

Telephone

REFERENCES
2, No. P-10

STATUS

☐ Operational ☐ Planned
☐ Approved ☐ Candidate
☒ Opportunity

First flight, yr 1990 Life 1 yr.
No. of flights ____
Duration of Flight, days ____

OBJECTIVE

To understand the initial conditions in the solar nebula, the process & formation & evolution for planetary bodies & evaluating the availability of lunar resources.

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 2

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ____

DESCRIPTION

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	160	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 300

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME Orbiting IR/Submillimeter Telescope

CODE GRUM0329

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-30
5,
6, P-12 & 78, 79
8,

STATUS Ref 2

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 98,

No. of flights ____

Duration of Flight, days ____

LIFE 10 yr

OBJECTIVE

Carry out a wide range of astrophysical observations in a spectral region that is not accessible to ground-based observatories because of the absorption of the terrestrial atmosphere

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ____

DESCRIPTION

Telescope & heterodyne spectrometer

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 700 Perigee, km 700 Tolerance ± _____
Inclination, deg High Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	500	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☒ Remote (Free Flyer)

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 10,000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg Cryogens

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Operate at high inclination to reduce thermal load. Ability to acquire & track fast moving asteroids & comets & track close to sun.

V83-0165-408(T)

PAYLOAD ELEMENT NAME | **CODE**

Origin of Plasma in the Earth Neighborhood GRUM0350

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-12

STATUS Ref. 2

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 89-9[illegible] Goddard, 86-87 (2) LIFE 4 yrs

No. of flights ____

Duration of Flight, days ____

OBJECTIVE

Determine the energy flow through the coupled heliosphere-magnetosphere-ionosphere system; to provide our understanding of plasma processes that are important in controlling the earth's nearby space environment

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10 ____

DESCRIPTION

Four S/C to be launched over a 12 month period. Orbital locations are: upstream of solar wind at the sunward libration point, geomagnetic tail 80-240 Re, eccentric solar orbit apogee 15 Re & eccentric equatorial orbit with apogee 12 Re. Observation will be coordinated with each other & ground based research program for magnetic field, ionospheric & auroral observations.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	145		
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 6 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 1000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

PAYLOAD ELEMENT NAME
Subsatellite Facility

CODE
GRUMO351

CONTACT

Name
Address

Telephone

REFERENCES

2, No. S-22
6, P-22 & 25

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

STATUS

☐ Operational ☐ Planned
☐ Approved ☒ Candidate
☐ Opportunity

First flight, yr 90 (2)
No. of flights ____
Duration of Flight, days ____

OBJECTIVE

Provide a platform near the space station to support in-situ observation, plasmadiagnosis, bistatic optical & radio experiments

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ____

DESCRIPTION

The subsatellite will be launched & recovered by the space station, must be fully maneuverable. It will be remotely controlled (instruments & Subsystems) & be operable for up to 30 days.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	50 (6)	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

179

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 450 (6)

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME Starprobe

CODE GRUMO352

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-20

STATUS Ref. 2

☐ Operational ☒ Planned

☐ Approved ☐ Candidate

☐ Opportunity

First flight, yr 88 (2) Life 5 yr

No. of flights ———

Duration of Flight, days ———

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10 5

OBJECTIVE

Determine the mechanism that heats the corona & drives the solar wind, the origin & release of energetic particles, high resolution solar imagining, gravity field & sun interior, general relativity & search for gravitational radiation

DESCRIPTION

A large (2.5 km/s) space storable propulsion system provides the ΔV for an intermediate (ΔV-EJGA) trajectory which is targeted for an Earth swingby, then a Jupiter swingby. Targeting at Jupiter defines a perihelion in late 1992 and would return to the Sun every 4 years thereafter. The spacecraft configuration is dominated by a large thermal shield which casts a shadow over the spacecraft. A "drag-free" sensor controls non-gravitational accelerations to an accuracy of 10^{-10} g for precision trajectory control and reconstruction.

V83-0165-408(T)

ORBIT CHARACTERISTICS Heliocentric, Perihelion 4 R sun

Apogee, km _____ Perigee, km 4 Rs Tolerance ± _____

Inclination, deg _____ Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	700	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 1500 at Op. Location

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

II/1/IV

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PAYLOAD ELEMENT NAME Solar Interior Dynamics Mission

CODE GRUM0353

CONTACT

Name

Address

Telephone

REFERENCE

2, No. S-21

6,

STATUS Ref. 2

☐ Operational ☐ Planned

☐ Approved ☒ Candidate

☐ Opportunity

First flight, yr 89 Life 2 yr + with servicing

No. of flights

Duration of Flight, days

TYPE

☒ Science & Applications (non-commercial)

☐ Commercial

☐ Technology Development

☐ Operations

Type Number (see Table A) 1

OBJECTIVE Measure the large-scale solar magnetic field, its structure, and long-term variations; to observe in detail the solar corona, and its time-varying temperature, velocity patterns, and density structure, to study global and local oscillations of the solar surface, as a probe of the convection zone.

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10

DESCRIPTION The SIDM spacecraft will be launched by Shuttle into a standard 300-km orbit, then inserted by on-board propulsion into a 575-km circular orbit. This altitude minimizes effects from the radiation belts, yet is above significant extreme ultraviolet (EUV) attenuation. After the two-year mission, enough fuel will remain to allow return to the standard Shuttle orbit for retrieval. The MMS can be utilized to support the instruments. The SIDM mission will be observing a quiet sun whereas SMM observes an active sun.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 575 Perigee, km 575 Tolerance ± _____

Inclination, deg 28 or 98 Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	800		
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 2600

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE MMS

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME Advanced Interplanetary Explorer

CODE GRUM0354

CONTACT

Name

Address

Telephone

REFERENCES

2, No. S-37
5,

STATUS Ref. 2

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 98 (7)

No. of flights ———

Duration of Flight, days ———

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ———

OBJECTIVE The AIE mission would intensively study the transient particle phenomena and associated electromagnetic emissions which are occurring locally in the solar system. These include phenomena related to solar flares, interplanetary shocks, corotating interactive regions, electrons emitted by the Sun and Jupiter, and solar modulation. In addition, the elemental, isotopic, and charge state compositions of various particle populations would be measured and compared.

DESCRIPTION The spacecraft would be a spinning spacecraft with spin axis normal to the ecliptic plane. A despun solar-oriented platform would be considered for solar wind composition measurements. The orbit would be a 50° x 15° halo orbit around the sunward libration point to keep it in the interplanetary medium at all times. Data would be recorded on-board for up to 24 hours each day to ensure 100 percent data coverage.

ORBIT CHARACTERISTICS S/C at $L_1 \approx$ 1500 KM from earth toward the sun

Apogee, km $L_a < 1$ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating		
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 700 Plus Propel. - assume 2500 Kg

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

S/C similar to open GRUM0350.

V83-0165-408(T)

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PAYLOAD ELEMENT NAME SCE
Solar Corona Explorer

CODE
GRUM0355

CONTACT

Name
Address

Telephone

REFERENCES

2, No. S-13
6,

STATUS Ref. 2

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 87 (2)
No. of flights ____
Duration of Flight, days ____

OBJECTIVE The Solar Corona Explorer will, investigate the structure, dynamics and evolution of the corona, in order to study, the close coupling between the inner corona and the heliosphere.

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 1

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ____

DESCRIPTION A three-year mission launched as close as possible to the minimum of the sunspot cycle when the corona and interplanetary medium are at their simplest, with large open magnetic field regions at the poles.

Instruments: White light coronagraph, soft X-ray imaging telescope, Resource line coronagraph, EUV diagnostic spectrometer.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 600 Perigee, km 600 Tolerance ± _____
Inclination, deg 33 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	300	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 400 + S/C Bus

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
Lower Atmospheric Research Satellite

CODE
GRUM0374

CONTACT

Name
Address

Telephone

REFERENCES
2, No. E-9

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

STATUS
- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 90 (2) Life 3 yr. +
No. of flights ———
Duration of Flight, days ———

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ———

OBJECTIVE The LARS mission will permit global tropospheric studies of the process governing the carbon/nitrogen/ozone and sulfur/ammonia/carbon/trace metal/aerosol systems, as well as the roles of transport, transformation and removal processes in governing the behavior of large-scale polluted masses.

DESCRIPTION The satellite will be placed in a high inclination orbit selected to provide global coverage of approximately twice a week for most instruments. The reusable satellite will contain a propulsion module capable of transfer to and from Space Station altitudes to 780 km. The instrument module will be replaceable in orbit, thus permitting the updating of sensors during the life of the Satellite.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km < 780 Perigee, km < 780 Tolerance ± _____

Inclination, deg 60-92.2 (Sun sync) Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec Knowledge of pointing 0.18°

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	1700	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
- operational min _____ max _____
- non-operational min _____ max _____

Heat Rejection, w
- operational min _____ max _____
- non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1170-Inst. only

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME **CODE**

GEO Operational Env. Satellite Follow-On GRUM0375

CONTACT

Name

Address

Telephone

REFERENCES

2, No. E-1

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

STATUS

- ☐ Operational
- ☐ Approved
- ☒ Planned
- ☐ Candidate
- ☐ Opportunity

First flight, yr 1991

No. of flights

Duration of Flight, days

OBJECTIVE A geosynchronous environmental satellite providing atmospheric sounding, continuous observations of earth's surface and cloud cover, daytime visible observations, daytime and nighttime infrared observations and space environment monitoring.

Importance of the Space Station to this Element

1 = low value but could use

10 = vital

Scale 1 - 10

DESCRIPTION The GOES payload includes a VISSR atmospheric Sounder (VAS) instrument which is a visible infrared Spin Scan Radiometer (VISSR) with atmospheric sounder capability. It provides simultaneous imaging in the visible portion of the spectrum with a resolution of 0.9 km and in the infrared (IR) portion of the spectrum with a resolution of approximately 6.9 km. Additionally, radiometric data is obtained in the earth's atmospheric water vapor and CO_2 absorption bands providing the capability to determinethe three-dimensional structure of the atmospheric temperature and humidity. A sub-system to measure energetic particles, solar x-ray flux, and magnetic fields at the satellite is provided.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km GEO Tolerance ± _____
Inclination, deg 0 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	330	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 874

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

198

11/1/IV

PAYLOAD ELEMENT NAME METSAT **CODE**

Advanced Operational Meteorological System GRUM0376

CONTACT References

Name Dr. M.H. Bortner 2, E-7
Address GE Space Systems Division 6, 47
PO Box 8555
Philadelphia, PA 19101

Telephone (215) 962-3282

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

First flight, yr 1990
No. of flights 1
Duration of Flight, days 730

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

OBJECTIVE

Upgrade of Current Op. Met. Sats. to test advanced instruments and develop a better operational system for measurement of wind velocity, sea state, ice and snow cover, water vapor, precipitation, ground and atmospheric temperatures.

DESCRIPTION

An improved version of current operational meteorological satellite systems, e.g., TIROS-N, GOES, NIMBUS, DMSP. Would probably include improved versions of current instruments such as AVHRR, SEM, SSU, AMSU, SBUV, SCAT, ALT, ERB, HIRS and other instruments currently carried on or considered for these systems.

• Companion to Meteorological Payload 0250.

ORBIT CHARACTERISTICS

Apogee, km 833 Perigee, km 833 Tolerance ± 19 - 19
Inclination, deg 98.7 Tolerance ± 0.15 - 0.15
Nodal Angle, Time 13:30 Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known)
Pointing accuracy, arc sec 720 Field of view, deg 6.8
Pointing Stability (Jitter) arc sec/sec 54
Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	500	
Standby		
Peak		

☒ Continuous

Voltage, V 5, 10, 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☒ Offline ☐ Other
☐ Encryption/Decryption Required
☒ Uplink Req.: Command Rate (KBS) 1.0 Frequency (MHZ)
☒ On-Board Data Processing Required
Description

Data Types: ☒ Analog ☐ Digital ☐ Hrs/Day
Film (Amount) 0 Voice (Hrs/Day) 1
Live TV (Hrs/Day) 24 Other
On-Board Storage (MBIT) 3000
Data Dump Frequency (Per Orbit) 1
Recording Rate (KBPS) 560 Downlink Frequency (MHZ) S-band, VHF

200
11/1/IV

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	10	max	25
	non-operational min		max	
Heat Rejection, w	operational min	500	max	500
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 2 W,m 1 H,m 0.5 Stowed

L,m 5 W,m 3 H,m 0.5 Deployed

Launch mass, kg 1100

Consumables Types

Acceleration sensitivity, g min max

CREW REQUIREMENTS

Crew Size 1 Task Assignment Observation outside FOV, checkout, calibration

Skills (See Table B)

SKILL	3					
LEVEL	2					
Hrs/Day	2					

EVA ☒ YES ☐ NO Reason Instrument change, servicing Hrs/EVA

SERVICING/MAINTENANCE

SERVICE: Interval, days Consumables, kg

Returnables, kg Man Hours

CONFIGURATION CHANGES: Interval, days Man/Hrs. Req.

Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

III/1/IV

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PAYLOAD ELEMENT NAME TOPEX
Ocean Circulation Mission

CODE GRUM0377

CONTACT

Name Dr. George Bethke
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone (215) 962-4432

References
2, E-6
6, P-33

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1990
No. of flights 1
Duration of Flight, days 1800

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

OBJECTIVE

Map ocean surface topography/surface roughness/wave heights/ wave directions. Wind speed and direction over the oceans will also be obtained. Precise ocean topography, density and geoid data will provide ocean circulation information.

DESCRIPTION

A radar altimeter (ALT) will provide precise ocean surface topography and roughness, while a two-channel microwave radiometer will allow correction for atmospheric effects on propagation of the ALT signal. The inclusion of a suitable microwave spectrometer (such as OWDS) can provide ocean wave direction, height, and wavelength. A microwave scatterometer (like SCAT) will enhance the mission with wind speed and direction.

ORBIT CHARACTERISTICS

Apogee, km 1300 Perigee, km 1300 Tolerance ± -
Inclination, deg 65 Tolerance ± 15°
Nodal Angle, deg ____ Ephemeris Accuracy, m ____
Escape dV Required, m/s ____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) ____
Pointing accuracy, arc sec 360 Field of view, deg 2
Pointing Stability (Jitter) arc sec/sec ____
Special Restrictions (Avoidance) Pointing knowledge: 30 arc sec

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	1000	18
Standby	____	____
Peak	____	____

☐ Continuous

Voltage, V 28 Frequency, Hz ____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other ____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) ____ Frequency (MHZ) ____
☐ On-Board Data Processing Required
Description ____

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day ____
Film (Amount) ____ Voice (Hrs/Day) ____
Live TV (Hrs/Day) ____ Other ____
On-Board Storage (MBIT) 600
Data Dump Frequency (Per Orbit) 2
Recording Rate (KBPS) 200 Downlink Frequency (MHZ) ____

V83-0165-408(T)

THERMAL

☐ Active ☒ Passive

Temperature, deg C	operational	min		max
	non-operational	min		max
Heat Rejection, w	operational	min	1000	max 1000
	non-operational	min		max

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 4 W, m 1 H,m 1 Stowed

L,m 7 W,m 4 H,m 2 Deployed

Launch mass, kg 1600

Consumables Types Thruster Gas

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 1 Task Assignment _____

Skills (See Table B)

SKILL	5					
LEVEL	2					
Hrs/Day	1					

EVA ☒ YES ☐ NO Reason Deployment & Repair Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Orbit must be known to within 1-2 cm altitude

V83-0165-408(T)

III/1/IV

ORIGINAL PAGE IS OF POOR QUALITY

PAYLOAD ELEMENT NAME	CODE
Windsat	GRUM0378

CONTACT

Name
Address

Telephone

REFERENCES

6, P-28

TYPE

- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 3

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 93 (based on METSAT)
No. of flights ———
Duration of Flight, days ———

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ———

OBJECTIVE Many of the problems in atmospheric dynamics are global. That is, events in the tropics influence mid-latitude weather several days later.

Remote sensing from space platforms have already shown great promise in providing measurements needed to describe phenomena ranging from individual thunderstorms to planetary scale circulations.

Advanced technology appears to be capable of providing remote soundings which surpass in-situ observations in quality, while retaining the vastly improved coverage only satellites can provide

DISCRIPTION

Measure atmospheric temperature remotely using passive infrared and microwave radiometric techniques.

New techniques involve the use of active sensors: lidar for water vapor profiling and radar for precipitation and liquid water content profiling.

A technique to measure wind profiles remotely has been developed using infrared lidar to measure the Doppler shift caused by aerosols drifting with the wind. Such a technique applied to a low-orbiting satellite, could measure wind profiles directly.

V83-0165-408(T)

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ORBIT CHARACTERISTICS

Apogee, km 400-800 Perigee, km 400-800 Tolerance ± _____
Inclination, deg Polar Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec 0.5° _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	5,000-8,000	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) 2.5 MBPS Downlink Frequency (MHZ) _____

V83-0165-408(T)

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III/1/IV

WINDSAT

THERMAL

☐ Active ☐ Passive High Heat Dissipation Load

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 2500

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE Repair, Calibrate

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

Revisit (Ovserve) area twice daily

V83-0165-408(T)

II/1/IV

ORIGINAL PAGE IS OF POOR QUALITY

PAYLOAD ELEMENT NAME
Upper Atmospheric Research Sat

CODE
GRUM0379

CONTACT

Name R.J. McNeal
Address NASA Headquarters
EBT-8

Telephone

REFERENCES
2, No. E-5

STATUS

☐ Operational ☒ Planned
☐ Approved ☐ Candidate
☐ Opportunity

First flight, yr 86 (7)
No. of flights ____
Duration of Flight, days ____

TYPE

☒ Science & Applications (non-commercial)
☐ Commercial
☐ Technology Development
☐ Operations

Type Number (see Table A) 3

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 ____

OBJECTIVE Study the radiation, chemistry, and dynamics of the stratosphere, mesosphere, and thermosphere and the coupling between these priorities. Interaction and coupling between atmsopheric regions and processes, particularly between chemistry and transport, will be emphasized.

DESCRIPTION The first payload will be placed in a 56° inclination orbit at an altitude of about 500 km, providing wide geographic coverage for and coverage of many of the scientific diurnal effects. The second payload at an inlcination of 70° provides coverage of high latitude effects and double coverage (with the first payload) of the Northern Hemisphere winter. Processed scientific data will be transmitted to earth via TDRSS.

Instrument Complement: Ion convection electrodynamics instrument, triaxial fluxgate magnetometer, particle environment monitor, solar ultraviolet spectrum irradiance monitor.

V83-0165-408(T)

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ORBIT CHARACTERISTICS

Apogee, km 500 Perigee, km 500 Tolerance ± _____
Inclination, deg 70 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	1000	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

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11/1/84

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg Cryo for Sensor Cooling

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME ALOS
Advanced Land Observing System

CODE
GRUM0400

CONTACT

Name
Address

Telephone

REFERENCES
2, No. R-6

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number _____ (see Table A)

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1989 (2) Life 5 yr
No. of flights _____ 2 S/C Reqd
Duration of Flight, days _____

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 _____

OBJECTIVE Advance the capability of land remote sensing instrumentation to provide multispectral data with 15-m resolution in the visible and near-IR and 30-m resolution in the shortwave IR bands, with stereoscopic and cross-track viewing capabilities.

DESCRIPTION ALOS will use an advanced scientific instrument, based on non-mechanical scanning (pushbroom mode) radiometer design for land observing missions of late 80's and beyond (current schedule calls for launch in third quarter of CY 1989).

ALOS will use the Multispectral Linear Array (MLA) sensor to provide: (1) 200 MLA scenes/day, fully corrected, 6 months after achieving final orbit; multispectral digital tapes, master photographic megatives, registered boundary maps; (2) final fully corrected high resolution stereo products 1 year after launch; (3) precision cartographic products (1:20,000) 1 year after launch. ALOS will use MMS as the spacecraft, with data downlink via TDRSS to N. Mexico.

V83-0165-408(T)

ORBIT CHARACTERISTICS

(sunsync)

Apogee, km 705 Perigee, km 705 Tolerance ± _____

Inclination, deg Polar Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	310	
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 1597

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Replenish Prop. & Replace Inst. & S/S Modules

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

Replenish Prop. & Replace Inst. & S/S Modules

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
ADVANCED EARTH RESOURCES SENSING SYSTEM I

CODE
GRUM0401

CONTACT (GOES Follow-On)

Name

Address

Telephone

REFERENCES
2, No. R-12

TYPE
- ☒ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 2

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 95
No. of flights
Duration of Flight, days

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10

OBJECTIVE Provide earth resources & environmental information in the following areas: agriculture, range management, forestry, geological resources, land use, water resources, environmental quality, disaster assessment, weather & climate, atmospheric properties, earth & ocean dynamics.

DESCRIPTION Four platforms positioned to cover land masses. Continuous coverage of abrupt events & synoptic surveillance. Will include active & passive earth sensing sensors. Will also include "special sensors" such as gravity gradiometer, magnetometers, particle/plasma measurements. Earth-sensing sensors include large optical sensor, MMW mapper & sounder, SAR.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km GEO Perigee, km GEO Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	_____	_____
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 5000 _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment _____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
ADVANCED EARTH RESOURCES SENSING SYSTEM II

CODE
GRUM0402

CONTACT

Name

Address

Telephone

REFERENCES
2, No. R-13

TYPE
- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A): 2

STATUS
- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr: 98
No. of flights:
Duration of Flight, days:

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10:

OBJECTIVE
Provide earth resources & environmental information in the following areas: agriculture, range measurement, forestry, geological resources, land use, water resources, environmental quality, disaster assessment, weather & climate atmospheric properties, earth & ocean dynamics.

DESCRIPTION Fifteen day repeat cycle in 181 revolutions; 1 platform in orbit subject to 6^{o}/day precession rate. All weather coverage of non-dynamic phenomena. Active & passive optical & microwave sensors, including: high resolution-mappers, -altimeters, -scatterometers, -sounders; wide field-mappers, -sounders. One platform for "leisurely" coverage of selected areas.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 400-1630 Perigee, km 400-1630 Tolerance ± _____
Inclination, deg 60 Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 6 Field of view, deg 10
Pointing Stability (Jitter) arc sec/sec 4
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating		
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational	min	max	
	non-operational	min	max	
Heat Rejection, w	operational	min	max	
	non-operational	min	max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg ____

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size ____ Task Assignment ____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME Communications R&D Lab

CODE GRUM1000

CONTACT

Name P. Caughran
Address COMSAT
950 L'Enfant Plaza SO SW
Washington, DC 20024

Telephone 202-863-7368

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1990
No. of flights 1 per year
Duration of Flight, days up to 365

OBJECTIVE

Perform a variety of experiments related to communications satellite technology. Experiments involve spacecraft bus and communications subsystems.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 7

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION

Experiment modules will be transported to the Space Station, attached to supporting services, the experiment conducted, data collected, data transmitted and/or transported to ground. Experimental equipment discarded or returned to ground.

V83-0165-408(T)

ORBIT CHARACTERISTICS

No Requirements

Apogee, km _____ Perigee, km _____ Tolerance ± _____

Inclination, deg _____ Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☒ Celestial ☒ Solar ☒ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec 36 Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC For Maximum Experiment

	Power, W	Duration, hrs/day
Operating	1500	8
Standby	500	16 for thermal cont.
Peak	1500	

☐ Continuous

Voltage, V 28 v Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☒ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

_____

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day _____

Film (Amount) 500 feet Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 10 M bit

Data Dump Frequency (Per Orbit) once

Recording Rate (KBPS) 0.1 Downlink Frequency (MHZ) _____

THERMAL

☐ Active ☒ Passive

Temperature, deg C	operational min	-10°C	max	+50°C
	non-operational min	-40°C	max	+90°C
Heat Rejection, w	operational min	100	max	750
	non-operational min	0	max	500

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☒ Remote 1 experiment, requires co-orbit satellite

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 3000 kg total of experiments

Consumables Types hydrazine, bipropellants

Acceleration sensitivity, g min ____ max 0.1 g

CREW REQUIREMENTS

Crew Size 1 Task Assignment occasional observation

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☒ YES ☐ NO Reason Install exp. Hrs/EVA 2

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days 7 Man/Hrs. Req. 1

Deliverables, kg ____ Returnables, kg 20 kg (mat. samples)

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME | **CODE**

Land Mobile Sat. Qual. & Acceptance | GRUM1001

CONTACT

Name P. Caughran
Address COMSAT
950 L'Enfant Plaza SO SW
Washington, D.C.

Telephone 202-863-7368

STATUS

☐ Operational ☐ Planned
☐ Approved ☒ Candidate
☐ Opportunity

First flight, yr 1998
No. of flights 3 (2 in 1998, 1 in 1999)
Duration of Flight, days 60 (then send GEO)

OBJECTIVE

Qualification and acceptance test, repair and retest of 3 satellites (2 operating, one spare) in LEO prior to GEO deployment.

TYPE

☐ Science & Applications (non-commercial)
☒ Commercial
☐ Technology Development
☐ Operations

Type Number (see Table A) 7

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

DESCRIPTION

One possible implementation is 3 890 MHz spacecraft each with a 100 m class antenna. They are each docked with the Space Station for health and status checks and deployment of all structures. Required repairs are made. The spacecraft are each individually detached and then maneuvered to a co-orbit location for antenna pattern measurements in conjunction with the Space Station. Modifications and adjustments are made as required after redocking to the Space Station. The spacecraft are then transferred to apogee at GEO attitude using an orbital transfer vehicle (OTV). Circularization at GEO attitude is accomplished with an integral propulsion system.

ORBIT CHARACTERISTICS

Apogee, km >300 Perigee, km >300 Tolerance ± _____

Inclination, deg 28.5° or less Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth Orbit Tangent

Truth Sites (if known) Space Station

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	0	
Standby	1000	24
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☒ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) 0.2 Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description
Record test data including 2-4 hr. TV coverage of antenna deployments.

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day 8-16

Film (Amount) _____ Voice (Hrs/Day) 1 hr/day

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 10

Data Dump Frequency (Per Orbit) once/orbit

Recording Rate (KBPS) 0.1 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 18 W, m 2 H,m 2 Stowed each

L,m 100 W,m 100 H,m 100 Deployed each

Launch mass, kg 10,000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Assist in spacecraft checkout. Repair

Skills (See Table B)

SKILL	7					
LEVEL	2					
Hrs/Day	8					

EVA ☒ YES ☐ NO Reason Repair Hrs/EVA 1-8

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

In the event of failure discovered prior to orbit raising, spare parts may have to be brought up on a subsequent shuttle flight for spacecraft repair.

V83-0165-408(T)

ORIGINAL PAGE IS OF POOR QUALITY

PAYLOAD ELEMENT NAME Inter. Comm. Sat Deploy & Service

CODE GRUM1002

CONTACT

Name P. Caughran
Address COMSAT
950 L'Enfant Plaza SO SW
Washington, D.C 20024

Telephone 202-863-7308

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1995
No. of flights 6
Duration of Flight, days 60

OBJECTIVE

Improve reliability of international communications satellite by testing in LEO before deployment to GEO and servicing in GEO.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 7

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 3

DESCRIPTION

Acceptance test international communications satellite in LEO. Repair as required prior to raising to GEO. Perform remote periodic servicing in GEO with service vehicle supported from LEO Space Station.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km >300 Perigee, km >300 Tolerance ± _____

Inclination, deg 28.5 or less Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth Orbit Tangent

Truth Sites (if known) Space Station

Pointing accuracy, arc sec 36 Field of view, deg 360

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	500	16	(detached from Station)
Standby	1000	24	☐ Continuous
Peak			

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☒ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) 0.2 Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day 16

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 10

Data Dump Frequency (Per Orbit) once/orbit

Recording Rate (KBPS) 0.1 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m 12 W, m 4.5 H,m 4.5 Stowed

L,m 26 W,m 26 H,m 20 Deployed

Launch mass, kg 6500

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 2 Task Assignment Monitor, Test, Repair

Skills (See Table B)

SKILL	7					
LEVEL	2					
Hrs/Day	16					

EVA ☒ YES ☐ NO Reason Repair Hrs/EVA 2-4

SERVICING/MAINTENANCE *

SERVICE: Interval, days 1800 Consumables, kg 6000

Returnables, kg _____ Man Hours 160

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

*at GEO by reusable OTV

V83-0165-408(T)

PAYLOAD ELEMENT NAME: HF Broadcast Satellite
CODE: GRUM1003

CONTACT

Name: P. Caughran
Address: COMSAT
950 L'Enfant Plaza So SW
Washington, DC 20024

Telephone

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr: 1995
No. of flights: 2
Duration of Flight, days: 60

OBJECTIVE

Provide HF sound broadcasting from GEO with large aperature HF antenna.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A): 7

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 7

DESCRIPTION

HF satellite requires LEO assembly of 200m class antenna and spacecraft acceptance test prior to GEO deployment.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km 300 Perigee, km 300 Tolerance ± _____

Inclination, deg 28.5 of less Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☒ Solar ☐ Earth Orbit Tangent

Truth Sites (if known) Space Station

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	500	16
Standby	2000	24
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) 0.2 Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day 24

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 10

Data Dump Frequency (Per Orbit) Once/orbit

Recording Rate (KBPS) 5 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☐ External ☒ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m 12 W, m 4.5 H,m 4.5 Stowed

L,m 30 W,m 300 H,m 300 Deployed

Launch mass, kg 13000

Consumables Types Bipropellant

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 3 Task Assignment Antenna assembly and spacecraft test

Skills (See Table B)

SKILL	7					
LEVEL	2					
Hrs/Day	8					

EVA ☒ YES ☐ NO Reason antenna assembly Hrs/EVA 2-4

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
Commercial R&D - Mater. Processing

CODE
GRUM1100

CONTACT

Name Dave Larson
Address Research Center, A01-26
Grumman Aerospace Corp.
Bethpage, N.Y. 11714

Telephone (516) 575-3286

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1992
No. of flights Continuous
Duration of Flight, days Continuous

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

OBJECTIVE

Provide laboratory for commercial materials processing research and development (R&D)

DESCRIPTION

Various furnaces and other operations are enabled as needed to support a large variety of commercial research and development programs. Furnace types considered are: directional solidification, Czochrolski solution crystal growth, float zone, acoustic levitation, electrostatic levitation and electromagnetic levitation. Other apparatus are: a continuous flow electrophoresis unit, a gel electrophoresis unit and a Jacobi protein crystal growth reactor.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km Any Perigee, km >300 Tolerance ± _____

Inclination, deg Any Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2000-30000/unit	24
Standby	_____	_____
Peak	_____	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☒ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description

Record 6-10 parameters/unit with 5 units operating. Compare to limits.

Data Types: ☐ Analog ☐ Digital ☒ Hrs/Day 24

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 30

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) .005 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C, Processing	operational min	20 - 600	max	150 - 5000
	non-operational min	10	max	30
Heat Rejection, w	operational min	2000	max	30000
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS *

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed Volume 5-30m^3 total

Launch mass, kg 300-1000/unit

Consumables Types electrical power

Acceleration sensitivity, g min 10^{-7} max 10^{-3}

CREW REQUIREMENTS

Crew Size 2-3 Task Assignment Set up units, load & unload materials.

Skills (See Table B)

SKILL	3					
LEVEL	2&3					
Hrs/Day	10					

EVA ☐ YES ☐ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE *

SERVICE: Interval, days .01-90/unit Consumables, kg 2-10/unit

Returnables, kg 2-10/unit Man Hours 2-8

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

*2-6 units may be operating simultaneously

V83-0165-408(T)

PAYLOAD ELEMENT NAME Commercial Production of HgCdTe

CODE GRUM1101

CONTACT

Name Dave Larson
Address Research Center, A01-26
Grumman Aerospace Corp.
Bethpage, N.Y. 11714

Telephone (516) 575-3286

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1991
No. of flights Cont.
Duration of Flight, days Cont.

OBJECTIVE

Commercial production of detector grade HgCdTe. Initial output ~100 kg of bulk product/year increasing to 1000 kg/year.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION

Plane front directional solidification in electric furnace. Ampoules are loaded in furnace and heated to processing temperature. The crystal is grown during controlled cooling and unloaded when completed. A 5 cm bore furnace is used to grow a single 2.75 kg crystal. The total cycle takes 11 days.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km Any Perigee, km >300 Tolerance ± _____

Inclination, deg Any Tolerance ± _____

Nodal Angle, deg Any Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	3500/furnace	24
Standby	0	14 hr/11 days/furn.
Peak	4200/furnace	2 hr/11 days/furn.

☐ Continuous

Voltage, V 240 AC Frequency, Hz 60

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☒ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☒ On-Board Data Processing Required

Description Monitor about 6 furnace parameters each furnace and compare to limits

Data Types: ☐ Analog ☐ Digital ☒ Hrs/Day 24

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 5

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) .001 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	1100	max	1700
	non-operational min	10	max	10
Heat Rejection, w	operational min		max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS *

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m ___ W, m ___ H,m ___ Stowed

L,m 1.5 W,m 1 H,m 2 Deployed /furnace

Launch mass, kg 800/furnace

Consumables Types 3.5 kw/furnace

Acceleration sensitivity, g min 10^{-7} max 10^{-5}

CREW REQUIREMENTS

Crew Size 1 Task Assignment Load & unload ampoules, monitor furnaces

Skills (See Table B)

SKILL	3					
LEVEL	2					
Hrs/Day	4 max					

EVA ☐ YES ☒ NO Reason ___ Hrs/EVA ___

SERVICING/MAINTENANCE *

SERVICE: Interval, days 11/furnace Consumables, kg 2.75/furnace

Returnables, kg 2.75/furnace Man Hours 4/furnace

CONFIGURATION CHANGES: Interval, days ___ Man/Hrs. Req. ___

Deliverables, kg ___ Returnables, kg ___

SPECIAL CONSIDERATIONS/See Instructions

*One to eleven furnaces are operating simultaneously.

V83-0165-408(T)

PAYLOAD ELEMENT NAME Commercial Prod. of Bulk Ga-As

CODE GRUM1102

CONTACT

Name: Dave Larson
Address: Research Center, A01-26
Grumman Aerospace Corporation
Bethpage, NY 11714

Telephone: (516) 575-3286

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr: 1991
No. of flights: Continuous
Duration of Flight, days: Continuous

OBJECTIVE

Commercial production of high purity, low defect density GaAs, bulk production projected at 218 kg/year in 1991 growing to 1620 kg/year in 2000.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A): 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 5

DESCRIPTION

Plane front directional solidification of bulk Ga-As crystals. Ampoules loaded in furnace and heated to processing temperature. The crystal is grown during controlled cooling and unloaded when completed. A 12cm bore furnace is used to grow a 10.21 kg crystal (25cm X 10cm dia) every 11 days.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km Any Perigee, km > 300 Tolerance ± _____

Inclination, deg Any Tolerance ± _____

Nodal Angle, deg Any Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	7000/furnace	24
Standby	0	14 hr/11 days/furnace
Peak	8500/furnace	2 hr/11 days/furnace

☐ Continuous

Voltage, V 440 Frequency, Hz 60

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☒ On-Board Data Processing Required

Description
Monitor about 6 furnace parameters each furnace and compare to limit

Data Types: ☐ Analog ☒ Digital ☒ Hrs/Day 24

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) 5

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) .001 Downlink Frequency (MHZ) _____

III/1/IV

THERMAL

☑ Active ☐ Passive

Temperature, deg C	operational min	1100	max	1700
	non-operational min	25	max	
Heat Rejection, w	operational min	7000	max	8500
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS *

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☒ Unpressurized

L,m	W, m	H,m		Stowed
L,m 1.5	W,m 1.5	H,m 2		Deployed

Launch mass, kg 900/furnace

Consumables Types 7.0 kw/furnace

Acceleration sensitivity, g min 10^{-7} max 10^{-4}

CREW REQUIREMENTS

Crew Size 1 Task Assignment Load & unload ampules, monitor furnaces

Skills (See Table B)

SKILL	3					
LEVEL	2					
Hrs/Day	4 max					

EVA ☐ YES ☑ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE *

SERVICE: Interval, days 11/furnace Consumables, kg 10.2./furnace

Returnables, kg 10.21/furnace Man Hours 4/furnace

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

*One to five furnaces are operating simultaneously.

V83-0165-408(T)

240

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PAYLOAD ELEMENT NAME Commercial Prod-Thin Film GaAs

CODE GRUM1103

CONTACT

Name Dave Larson
Address Research Center, A01-26
Grumman Aerospace Corporation
Bethpage, NY 11714

Telephone (516) 575-3286

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1996 (May)
No. of flights Continous
Duration of Flight, days Continous

OBJECTIVE

Produce high quality thin films of GaAs. Initial annual production in 1996 is 200 kg growing to 600 kg/year in 2000.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION

The electroepitaxy process is used to produce low defect density films of Ga-As on substrates. Sealed modules, containing a solution and several substrates, are loaded each day in a unit. Each module contains about 3 liters of solution, is about 15 cm in diameter, and weighs approximately 2 3/4 kg. The yield per module is about $\frac{1}{2}$ kg of useable 4" diameter samples.

V83-0165-408(T)

Commercial Prod-thin film GaAs

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km >300 Tolerance ± _____
Inclination, deg any Tolerance ± _____
Nodal Angle, deg any Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	6500/unit	18
Standby		4
Peak	7500/unit	2

☐ Continuous

Voltage, V 480 Frequency, Hz 60

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required

Description
temperature, g, current, voltage and time are monitored and compared to limits

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day 24
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) 5 _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) .001 Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	1025	max	1250
	non-operational min	10	max	30
Heat Rejection, w	operational min	as input	max	as input
	non-operational min	0	max	

EQUIPMENT PHYSICAL CHARACTERISTICS *

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m	W, m		H,m	Stowed
L,m 2	W,m 2		H,m 2	Deployed

Launch mass, kg 700/unit

Consumables Types 6.5kw/unit

Acceleration sensitivity, g min 10^{-5} max 10^{-3}

CREW REQUIREMENTS

Crew Size 1 Task Assignment Load and unload modules, monitor units

Skills (See Table B)

SKILL	3					
LEVEL	2					
Hrs/Day	4					

EVA ☐ YES ☒ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE *

SERVICE: Interval, days 1 Consumables, kg 2 3/4/unit

Returnables, kg 2 3/4/unit Man Hours 4 hrs/unit

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

* Needs a clean room or equivalent type of operation. One to three units are operating.

V83-0165-408(T)

AI/11/IV

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PAYLOAD ELEMENT NAME Commercial Prod -Protein Crystals
CODE GRUM1104

CONTACT

Name Dave Larson
Address Research Center, A01-26
Grumman Aerospace Corp.
Bethpage, NY 11714

Telephone (516) 575-3286

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1992
No. of flights Continuous
Duration of Flight, days Continuous

OBJECTIVE

Commercial production of a variety of protein single crystals for crystallographic and drug interaction studies. Initial production ~1300 crystals/year increasing to 10,000/year in 2000.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION

Growth from solution of protein single crystals using the Jakoby method. Produced in batches of 80 in 5000 cc. of solution weighting 5 kg. Solution loaded in reactor, heated, cooled and unloaded.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km Any Perigee, km >300 Tolerance ± _____

Inclination, deg Any Tolerance ± _____

Nodal Angle, deg Any Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	1000/reactor	24
Standby	0	8 hr/21 days/reactor
Peak	1500/reactor	2 hr/21 days/reactor

☐ Continuous

Voltage, V 220 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☑ Offline ☒ Other Possible TV monitoring

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☑ On-Board Data Processing Required

Description Sensing of temp, g & time every minute for each reactor and compare to limits

Data Types: ☐ Analog ☒ Digital ☒ Hrs/Day 24

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) 24 possible Other _____

On-Board Storage (MBIT) 5

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) .001 Downlink Frequency (MHZ) _____

V83-0165-408(T)

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II/1/IV

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	25	max	150
	non-operational min	10	max	25
Heat Rejection, w	operational min	1000	max	1500
	non-operational min	0	max	0

EQUIPMENT PHYSICAL CHARACTERISTICS *

Location: ☐ Internal ☐ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m 1 W,m 1 H,m 1 Deployed

Launch mass, kg 300

Consumables Types 1.0 kw./reactor

Acceleration sensitivity, g min 10^{-5} g max 10^{-3} g

CREW REQUIREMENTS

Crew Size 1 Task Assignment Load & unload reactor

Skills (See Table B)

SKILL	3					
LEVEL	2					
Hrs/Day	8 max					

EVA ☐ YES ☑ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE *

SERVICE: Interval, days 21/reactor Consumables, kg 5 kg/reactor

Returnables, kg 5 kg/reactor Man Hours 8/reactor

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

*One to eight reactors are operating simutaneously.

PAYLOAD ELEMENT NAME Isoenzyme Separations

CODE GRUM 1105

CONTACT

Name Dr. Paul Shachter
Address GE Space Division
Box 8555
Philadelphia, PA 19101

Telephone (215) 962-3280

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1990
No. of flights 3
Duration of Flight, days 360/540/continuous

OBJECTIVE

Economical separation of preparative amounts of isoenzyme (antigens) for use in the production of diagnostic kits for a variety of diseases.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

DESCRIPTION

Electrophoretic system for the batch processing of tubes filled with a large pore gel and proteins. The desired isoenzyme is isolated from the other proteins electrophoretically. The required equipment includes the electrophoretic separation units, storage freezer for the tubes, buffer reservoir and pump, chamber cooling system, power supply and control module.
Pilot Plant - 1 separation unit (1990)
Small scale production - 2 separation units (1992)
Large scale production - 4 separation units (1994) growing to 10 units (2000)

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -

Inclination, deg any Tolerance ± -

Nodal Angle, deg any Ephemeris Accuracy, m

Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known)

Pointing accuracy, arc sec Field of view, deg

Pointing Stability (Jitter) arc sec/sec

Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day	
Operating	375/unit	14.5	
Standby	50	9.5	☐ Continuous
Peak			

Voltage, V 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☐ Offline ☐ Other

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)

☐ On-Board Data Processing Required

Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day

Film (Amount) Voice (Hrs/Day) 1

Live TV (Hrs/Day) Other

On-Board Storage (MBIT)

Data Dump Frequency (Per Orbit)

Recording Rate (KBPS) 100 Downlink Frequency (MHZ)

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	375/unit	max	
	non-operational min	50	max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

0.5 m^3/unit

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 200 kg/unit

Consumables Types ____

Acceleration sensitivity, g min 10^{-3} max 10^{-2}

CREW REQUIREMENTS

Crew Size 1 Task Assignment ____

Skills (See Table B)

SKILL	2					
LEVEL	2					
Hrs/Day/Unit	0.15					

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days 30 Consumables, kg 3/unit

Returnables, kg 3/unit Man Hours 1

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME
Continuous Flow Electrophoresis

CODE
GRUM 1106

CONTACT

Name Dr. Richard Griffin
Address GE Malta Test Station
1 River Road
Schenectady, NY 12345

Telephone (518) 899-4292

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1990
No. of flights 1
Duration of Flight, days continuous

OBJECTIVE

To develop a capability for performing separation processes on biological substances of potential commercial value, using continuous flow electrophoresis.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number 8
(see Table A)

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 6

DESCRIPTION

Equipment consists of three standard (19 inch) racks containing the following units: (1) electrophoretic unit, (2) control panel, (3) data management unit, (4) cryogenic freezer, (5) buffer/waste storage, (6) centrifuge, (7) environmental control unit.

V83-0165-408(T)

11/1/84

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -

Inclination, deg any Tolerance ± -

Nodal Angle, deg any Ephemeris Accuracy, m

Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known)

Pointing accuracy, arc sec Field of view, deg

Pointing Stability (Jitter) arc sec/sec

Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	700	24 hrs/day
Standby	250	6 hrs/week
Peak	N/A	

☐ Continuous

Voltage, V 28 Frequency, Hz -

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☐ Offline ☐ Other

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) - Frequency (MHZ) -

☐ On-Board Data Processing Required

Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day

Film (Amount) Voice (Hrs/Day) 1 hr/day

Live TV (Hrs/Day) Other

On-Board Storage (MBIT) 2.16

Data Dump Frequency (Per Orbit) once/orbit

Recording Rate (KBPS) 0.400 Downlink Frequency (MHZ) TBD

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	250	max	700
	non-operational min	0	max	100

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m	W, m		H,m	Stowed
L,m 0.9	W,m 1.76		H,m 2.75	Deployed

Launch mass, kg 410/unit

Consumables Types buffer and samples

Acceleration sensitivity, g min 10^{-4} max 10^{-3}

CREW REQUIREMENTS

Crew Size 1 Task Assignment

Skills (See Table B)

SKILL	2					
LEVEL	2					
Hrs/Day	3					

EVA ☐ YES ☒ NO Reason Hrs/EVA

SERVICING/MAINTENANCE

SERVICE: Interval, days 30 Consumables, kg 250/unit

Returnables, kg 250/unit Man Hours 5/unit

CONFIGURATION CHANGES: Interval, days Man/Hrs. Req.

Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

Certain specimens frozen with LN_2 at $100^{o}K$.

V83-0165-408(T)

II/1/IV

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PAYLOAD ELEMENT NAME
X-ray Target Production

CODE
GRUM 1107

CONTACT

Name R T. Frost
Address GE Space Division
Box 8555
Philadelphia, PA 19101

Telephone (215) 962-3517

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1993
No. of flights 1
Duration of Flight, days 900

OBJECTIVE

Pilot plant production of x-ray target segments using electromagnetic containerless positioning, electron beam heating, and undercooling or vapor deposition processing to improve grain structure. New improved product for applications in CAT systems.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 10

DESCRIPTION

Electromagnetic containerless processing facility with electron beam melting, vacuum controls, automated specimen insertion and retrieval, pyrometric control of processing temperature. Facility to include storage facilities for preprocessed and post-processed specimens and instrumentation to afford quality control to finished product with feedback to process parameters.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± –

Inclination, deg any Tolerance ± –

Nodal Angle, deg any Ephemeris Accuracy, m

Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known)

Pointing accuracy, arc sec Field of view, deg

Pointing Stability (Jitter) arc sec/sec

Special Restrictions (Avoidance)

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	15,000	12
Standby	1,000	12
Peak		

☐ Continuous

Voltage, V 220/440 Frequency, Hz 60 or 400

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☐ Offline ☐ Other

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)

☒ On-Board Data Processing Required

Description
Microprocessor controls process variables from sensor outputs

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day 24

Film (Amount) Voice (Hrs/Day)

Live TV (Hrs/Day) Other

On-Board Storage (MBIT) 1 MBIT recording of process variables

Data Dump Frequency (Per Orbit) once per day

Recording Rate (KBPS) < 1 Downlink Frequency (MHZ) < 1

V83-0165-408(T)

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational min	10	max	30
	non-operational min	2	max	50
Heat Rejection, w	operational min	15,000	max	15,000
	non-operational min	1,000	max	1,000

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m — W, m — H,m — Stowed

L,m 4 W,m 2 H,m 2 Deployed

Launch mass, kg 2000

Consumables Types Inert gas

Acceleration sensitivity, g min 10^{-4} max 10^{-3}

CREW REQUIREMENTS

Crew Size 1 Task Assignment

Skills (See Table B)

SKILL	5					
LEVEL	2					
Hrs/Day	4					

EVA ☐ YES ☒ NO Reason Hrs/EVA

SERVICING/MAINTENANCE

SERVICE: Interval, days 30 Consumables, kg 192*

Returnables, kg 182 Man Hours 16

CONFIGURATION CHANGES: Interval, days Man/Hrs. Req.

Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

Vacuum venting required (10^{-3} torr, 100 PA) for pumps. This space-based manufacturing/processing underwent economic analysis as a commercial venture under the previous GE BUS study.

*Consumables each 30 days include 30 kg inert gas plus 182 kg raw materials.

PAYLOAD ELEMENT NAME Monodisperse Latex Reactor

CODE GRUM1108

CONTACT

Name Mr. Frank Vicente
Address GE Space Division
PO Box 8555
Philadelphia, PA 19101

Telephone (215) 962-2801

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1992
No. of flights 1
Duration of Flight, days 1800

OBJECTIVE

Produce monodisperse latex spheres which have large size and precise diameters, for use in medical research and calibration of particle counters.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 8

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

DESCRIPTION

A production reactor system capable of batch processing approximately 20 liters of material to produce latex spheres in the range of 3 to 100 microns.

V83-0165-408(T)

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± -

Inclination, deg any Tolerance ± -

Nodal Angle, deg any Ephemeris Accuracy, m

Escape dV Required, m/s

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known)

Pointing accuracy, arc sec Field of view, deg

Pointing Stability (Jitter) arc sec/sec

Special Restrictions (Avoidance)

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	22000	20
Standby		
Peak	20,000	0.5

☒ Continuous

Voltage, V 28 Frequency, Hz

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) Frequency (MHZ)

☐ On-Board Data Processing Required

Description

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day

Film (Amount) Voice (Hrs/Day) 1

Live TV (Hrs/Day) Other

On-Board Storage (MBIT)

Data Dump Frequency (Per Orbit)

Recording Rate (KBPS) 0.5 Downlink Frequency (MHZ)

III/1/IV

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational min	18	max	27
	non-operational min		max	
Heat Rejection, w	operational min	1,000	max	
	non-operational min		max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m	W, m	H,m	Stowed
L,m 0.5	W,m 3	H,m 2	Deployed

Launch mass, kg 3000

Consumables Types

Acceleration sensitivity, g min max 10^{-4}

CREW REQUIREMENTS

Crew Size 1 Task Assignment

Skills (See Table B)

SKILL	2					
LEVEL	2					
Hrs/Day	2					

EVA ☐ YES ☒ NO Reason Hrs/EVA

SERVICING/MAINTENANCE

SERVICE: Interval, days 30 Consumables, kg 30

Returnables, kg 30 Man Hours 2

CONFIGURATION CHANGES: Interval, days Man/Hrs. Req.

Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

V83-0165-408(T)

PAYLOAD ELEMENT NAME Stereoscopic Imaging System

CODE GRUM1200

CONTACT

Name Mark Sistilli
Address GE Space Systems Division
PO Box 8555
Philadelphia, PA 19101

Telephone 215-962-2017

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☐ Candidate
- ☒ Opportunity

First flight, yr 1990
No. of flights 1
Duration of Flight, days 180

OBJECTIVE

Global stereo mapping for topographic surveys.

TYPE

- ☐ Science & Applications (non-commercial)
- ☒ Commercial
- ☐ Technology Development
- ☐ Operations

Type Number (see Table A) 6

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

DESCRIPTION

Multi-exposure stereo film camera (or pushbroom multispectral linear array in stereo mode)

ORBIT CHARACTERISTICS

Apogee, km LEO Perigee, km LEO Tolerance ± -
Inclination, deg 60°-90°/sun sync Tolerance ± -
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec 36-360 Field of view, deg 5
Pointing Stability (Jitter) arc sec/sec 0.36
Special Restrictions (Avoidance) _____

POWER

☐ AC ☒ DC

	Power, W	Duration, hrs/day
Operating	50-75	6
Standby		
Peak		

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) 30 kg/mo Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

V83-0165-408(T)

THERMAL

☐ Active ☒ Passive

Temperature, deg C	operational	min		max
	non-operational	min		max
Heat Rejection, w	operational	min	50	max 75
	non-operational	min		max

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m	0.864	W, m	1.09	H,m	0.71	Stowed
L,m	0.864	W,m	1.09	H,m	0.71	Deployed

Launch mass, kg 90 kg

Consumables Types Film

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Monitor

Skills (See Table B)

SKILL	4					
LEVEL	2					
Hrs/Day	1					

EVA ☒ YES ☐ NO Reason Installation, calibration, servicing (film changes)

SERVICING/MAINTENANCE

SERVICE: Interval, days 30 Consumables, kg 30

Returnables, kg 30 Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

ENCLOSURE (2)

Science & Application Missions References

1. UAH/NASA Workshop on Space Science Platform, August 21-25, 1978
2. SpaceSystems Technology Model, September 1981
3. Science & Applications Space Platform Payload Accommodations Study, SP82-MSFC-2583 March 1982
4. Space Operations Center Systems Analysis Study Extension, GAC, January 1982
5. Project Concept Summary, October 1980. A number of individual reports on specific missions
6. Science & Applications Requirement for Space Station (Draft) - handout at Mid-term Briefing November 17, 1982
7. SOC Mission Model
8. Technology for Space Astrophysics Conference Next 30 Years October 4-6, 1982 - Submillimeter & Infrared Astronomy
9. Space Platform Mission Information Document, October 1982, SP82-MSFC-2623, Teledyne Brown Engineering

PAYLOAD ELEMENT NAME Controlled Ecological Life Support System **CODE** GRUM2001

CONTACT

Name J. Goodwin
Address Grumman Aerospace Corporation
A09-25
Bethpage, N.Y. 11714

Telephone 516 575-7801

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1995
No. of flights 1 per year
Duration of Flight, days 365 days

OBJECTIVE Perform a variety of experiments related to developing a controlled ecological life support system experiments involve biological digestion of wastes and the growing/synthesis of food.

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 15

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 10

DESCRIPTION Experiment modules will be transported to the space station and attached to the space station ECLS. The experiment will be conducted, and products analized, data collected, data transmitted, and products utilized. Experimental equipment integrated into ECLS or returned to ground.

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	50	24
Standby		
Peak	50	

☐ Continuous

Voltage, V 28 Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

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THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min ____ max ____
non-operational min ____ max ____

Heat Rejection, w — operational min ____ max ____
non-operational min ____ max ____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg 1000 Kg total

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Periodic Observation & Analysis

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day	2					

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days 7 Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. 1

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

PAYLOAD ELEMENT NAME **CODE** GRUM 2002

Large Structures Technology Development

CONTACT

Name C.J. Goodwin
Address Grumman Aerospace Corporation
South Oyster Bay Road
Bethpage, NY 11714

Telephone 516 575-7801

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 92
No. of flights 2
Duration of Flight, days 90

OBJECTIVE To develop technology for equipments to assemble & verify integrity of large structures in space environment

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 10

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION Unfold/assemble, rig & survey structure built from components brought up by orbiter. Perform structural static, dynamic & thermal effects tests. Inspect, repair if necessary, fold/disassemble, stow on station. Repeat, with necessary modifications, when results of initial test have been analyzed.

ORBIT CHARACTERISTICS - As Space Station

Apogee, km _____ Perigee, km _____ Tolerance ± _____

Inclination, deg _____ Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) None

Pointing accuracy, arc sec None Field of view, deg None

Pointing Stability (Jitter) arc sec/sec None

Special Restrictions (Avoidance) Constant sun or constant shadow

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2000	8
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☒ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

THERMAL

☐ Active ☒ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☒ Unpressurized

L,m 4 W, m 4 H,m 4 Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 5,000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 3 Task Assignment _____

Skills (See Table B)

SKILL	5	5				
LEVEL	3	2				
Hrs/Day	8	16				

EVA ☒ YES ☐ NO Reason Extnl Activity Hrs/EVA 12/Day

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____
Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____
Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

To minimize station control impact, extend structure along local vertical.

PAYLOAD ELEMENT NAME Large Antenna Technology Development **CODE** GRUM 2003

CONTACT

Name C.J. Goodwin
Address Grumman Aerospace Corporation
South Oyster Bay Road
Bethpage, NY 11714

Telephone 516 575-7801

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 94
No. of flights 2
Duration of Flight, days 30

OBJECTIVE To develop technology for assembling, verifying & measuring beam patterns of a large antenna in space

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 7

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 _____

DESCRIPTION Unfold/assemble & tension antenna. Conduct topographical survey. Perform static, dynamic & thermal effects test. Measure beam patterns & side lobes using co-orbiting RF source. Inspect, repair if necessary, fold/disassemble, stow on station. Repeat, with necessary modifications, when results of initial test have been analyzed.

ORBIT CHARACTERISTICS - As Space Station

Apogee, km _____ Perigee, km _____ Tolerance ± _____

Inclination, deg _____ Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg 360 Plane Containing Velocity Vector

Pointing Stability (Jitter) arc sec/sec Isolated

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating		
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☒ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☒ On-Board Data Processing Required

Description

_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

11/1/IV

THERMAL

☐ Active ☒ Passive

Temperature, deg C	operational	min	max	
	non-operational	min	max	
Heat Rejection, w	operational	min	max	
	non-operational	min	max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☐ Unpressurized

L,m 4	W, m 4	H,m 4		Stowed
L,m 50	W,m 50	H,m 50		Deployed

Launch mass, kg 1000

Consumables Types

Acceleration sensitivity, g min max

CREW REQUIREMENTS

Crew Size 3 Task Assignment

Skills (See Table B)

SKILL	3	3				
LEVEL	3	2				
Hrs/Day	8	16				

EVA ☒ YES ☐ NO Reason External Activity Hrs/EVA 12/Day

SERVICING/MAINTENANCE

SERVICE: Interval, days Consumables, kg

Returnables, kg Man Hours

CONFIGURATION CHANGES: Interval, days Man/Hrs. Req.

Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

RF Source Satellite To Co-Orbit

PAYLOAD ELEMENT NAME Large Optics Technology Development

CODE GRUM 2004

CONTACT

Name C.J. Goodwin
Address Grumman Aerospace Corporation
South Oyster Bay Road
Lethpage, NY 11714

Telephone 516 575-7801

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1993
No. of flights 2
Duration of Flight, days 90

OBJECTIVE Space assy. of optical reflector segments & measurement of tolerances over range of temperatures.

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 16

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

DESCRIPTION Assemble & rig ground fabricated reflector segments. Survey for surface accuracy. Conduct optical performance static & dynamic tests. Thermal effects tests. Inspect, disassemble, stow on station. Repeat when results of initial tests have been analyzed.

ORBIT CHARACTERISTICS As Space Station

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg Narrow
Pointing Stability (Jitter) arc sec/sec Isolated
Special Restrictions (Avoidance) Avoid Direct Sun Pointing

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	1000	24
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☒ On-Board Data Processing Required
Description
_____

Data Types: ☒ Analog ☒ Digital ☒ Hrs/Day 8
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

THERMAL

☐ Active ☒ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☒ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☒ Unpressurized

L,m 4 W, m 4 H,m 4 Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 7,500

Consumables Types _____ _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 3 Task Assignment _____

Skills (See Table B)

SKILL	3	3				
LEVEL	3	2				
Hrs/Day	8	16				

EVA ☒ YES ☐ NO Reason External Activity Hrs/EVA 12/Day

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

PAYLOAD ELEMENT NAME Air Maneuvering OTV Technology

CODE GRUM 2005

CONTACT

Name C.J. Goodwin
Address Grumman Aerospace Corporation
A09-25
Bethpage, NY 11714

Telephone 516 575-7801

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A): 13

First flight, yr: 1994
No. of flights: 3
Duration of Flight, days: 20

OBJECTIVE Test a small air maneuvering satellite to develop and evaluate thermal protection, aerodynamic control and guidance algorithms.

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10: 5

DESCRIPTION The air maneuvering satellite is stored on the Space Station and loaded on an OTV along with other communications payloads destined for GEO. It is separated from the OTV during the return leg of the OTV orbit and the orbit is altered to penetrate the atmosphere during perigee.

ORBIT CHARACTERISTICS

Apogee, km GEO Perigee, km 90 Tolerance ± _____
Inclination, deg any Tolerance ± _____
Nodal Angle, deg any Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	2000	1
Standby		
Peak		

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) 20
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m _____ W, m _____ H,m _____ Stowed

L,m _____ W,m _____ H,m _____ Deployed

Launch mass, kg 2000 - 3000

Consumables Types none

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 2 Task Assignment Install test unit on OTV

Skills (See Table B)

SKILL	7	7				
LEVEL	2	1				
Hrs/Day	5	5				

EVA ☒ YES ☐ NO Reason Mate to OTV Hrs/EVA 2

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg None _____

Returnables, kg None Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

PAYLOAD ELEMENT NAME **CODE** GRUM 2006

High Specific Impulse Propulsion

CONTACT

Name C.J. Goodwin
Address Grumman Aerospace Corporation
A09-25
Bethpage, NY 11714

Telephone 516 575-7801

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1994
No. of flights 3
Duration of Flight, days 20

OBJECTIVE Test and develop improved high specific impulse propulsion systems.

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 13

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

DESCRIPTION Improved propulsion systems of any size are tested externally on the Space Station. Two nozzles are mounted in opposite directions to avoid major station disturbances. After mounting the tests are controlled internally.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	_____	_____	
Standby	_____	_____	☐ Continuous
Peak	_____	_____	

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) 10
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

THERMAL

☐ Active ☐ Passive

Temperature, deg C	operational	min	max	
	non-operational	min	max	
Heat Rejection, w	operational	min	max	
	non-operational	min	max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 2 W, m 1 H,m 1 Stowed

L,m 2 W,m 1 H,m 1 Deployed

Launch mass, kg 1000

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Install units on Stationand run tests

Skills (See Table B)

SKILL	7					
LEVEL	2					
Hrs/Day	10					

EVA ☒ YES ☐ NO Reason Installation Hrs/EVA 4

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

Propulsion nozzles mounted so that exhaust does not damage station.

PAYLOAD ELEMENT NAME **CODE** GRUM 2007

Low Loss Cryo Propellant Storage

CONTACT

Name C.J. Goodwin
Address Grumman Aerospace Corporation
A09-25
Bethpage NY 11714

Telephone 516 575-7801

STATUS

☐ Operational ☐ Planned
☐ Approved ☒ Candidate
☐ Opportunity

First flight, yr 1994
No. of flights 3 - 4
Duration of Flight, days 30 - 90

OBJECTIVE Test and evaluate low loss cryo propellant storage systems which re-liquify boiled off propellant.

TYPE

☐ Science & Applications (non-commercial)

☐ Commercial

☒ Technology Development

☐ Operations

Type Number (see Table A) 13

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 8

DESCRIPTION The self contained (power possibly excepted) systems are externally mounted on the Space Station and evaluated over a 30 day period to determine losses.

ORBIT CHARACTERISTICS

Apogee, km any Perigee, km any Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	TBD	24	
Standby			☒ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☒ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☒ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) 5
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) .001 Downlink Frequency (MHZ) _____

11/1/IV

THERMAL

☐ Active ☐ Passive

Temperature, deg C — operational min _____ max _____

non-operational min _____ max _____

Heat Rejection, w — operational min _____ max _____

non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m 3 W, m 4 H,m 4 Stowed

L,m 3 W,m 4 H,m 4 Deployed

Launch mass, kg 2000

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size 1 Task Assignment Install unit and run test

Skills (See Table B)

SKILL	7					
LEVEL	2					
Hrs/Day	1					

EVA ☒ YES ☐ NO Reason Installation Hrs/EVA 4

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

PAYLOAD ELEMENT NAME **CODE** GRUM 2008

Liquid Droplet Radiator

CONTACT

Name Robert Haslett (A09-25)
Address Grumman Aerospace Corporation
Bethpage, NY 11714

Telephone 516 575-3924

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 16

First flight, yr _____
No. of flights _____
Duration of Flight, days _____

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 5

OBJECTIVE Demonstration and technical verification of an advanced liquid droplet space radiator concept under acutal operational space station conditions (zero-gravity, space vacuum, space plasma, attitude control manuevering perturbation, etc., during long duration operations). Determine operational characterisitcs, constraints and effects of space station/radiator interface.

DESCRIPTION The candidate liquid droplet radiator systems could be integrated /connected to the space station thermal management system at the heat rejection interface point. The system assembly would be installed as an auxilliary experimental heat rejection system. Waste heat load would be supplied by the space station (as an option a separate source could be used) commensurate to the size of the liquid droplet radiator system.

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	100 W		
Standby			☐ Continuous
Peak			

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☐ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____
☐ On-Board Data Processing Required
Description
_____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) _____
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) _____
Data Dump Frequency (Per Orbit) _____
Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

THERMAL

☒ Active ☐ Passive

Temperature, deg C	operational	min	max	
	non-operational	min	max	
Heat Rejection, w	operational	min	max	
	non-operational	min	max	

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Functior ☐ Pressurized ☒ Unpressurized

L, m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg ____

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 1 Task Assignment ____

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☒ YES ☐ NO Reason Mt. Expm't. Adj. collector Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days ____ Man/Hrs. Req. ____

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions

h-7

AI/T/II

PAYLOAD ELEMENT NAME Earth Observation Instrument Development **CODE** GRUM 2009

CONTACT

Name W.E. Howell
Address Langley Research Center
Hampton, Virgina 23665

Telephone

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

First flight, yr 1991
No. of flights TBD
Duration of Flight, days ____

OBJECTIVE

To develop instruments which sense various terrestrial & Global environment phenomena.

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 12

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

DESCRIPTION Present space instrumentation is restricted to highly selected bands in the electromagnetic spectrum (e.g. the visible and relatively narrow RF regions). As our speculation and understanding of various physical processes increase, we will need to develop sensors with an increasingly wide variety of attributes. These sensors will, of course, be initially built and limited testing performed on the Earth; however, full operational potential can be best obtained if developmental testing is done from the space station.

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____

Inclination, deg _____ Tolerance ± _____

Nodal Angle, deg _____ Ephemeris Accuracy, m _____

Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☒ Earth

Truth Sites (if known) _____

Pointing accuracy, arc sec _____ Field of view, deg _____

Pointing Stability (Jitter) arc sec/sec _____

Special Restrictions (Avoidance) _____

POWER

☐ AC ☐ DC

	Power, W	Duration, hrs/day
Operating	_____	3
Standby	_____	_____
Peak	25 KW	_____

☐ Continuous

Voltage, V _____ Frequency, Hz _____

DATA/COMMUNICATIONS

Monitoring requirements:

☐ None ☐ Realtime ☐ Offline ☐ Other _____

☐ Encryption/Decryption Required

☐ Uplink Req.: Command Rate (KBS) _____ Frequency (MHZ) _____

☐ On-Board Data Processing Required

Description _____

Data Types: ☐ Analog ☐ Digital ☐ Hrs/Day _____

Film (Amount) _____ Voice (Hrs/Day) _____

Live TV (Hrs/Day) _____ Other _____

On-Board Storage (MBIT) _____

Data Dump Frequency (Per Orbit) _____

Recording Rate (KBPS) _____ Downlink Frequency (MHZ) _____

11/1/IV

THERMAL

☒ Active ☒ Passive

Temperature, deg C
operational min _____ max _____
non-operational min _____ max _____

Heat Rejection, w
operational min _____ max _____
non-operational min _____ max _____

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☐ Internal ☒ External ☐ Remote

Equipment ID/Function ☐ Pressurized ☒ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m 50 m dia. H,m ____ Deployed

Launch mass, kg _____

Consumables Types _____

Acceleration sensitivity, g min _____ max _____

CREW REQUIREMENTS

Crew Size _____ Task Assignment Install'n, calibration, vary operation parameters

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☒ YES ☐ NO Reason _____ Hrs/EVA _____

SERVICING/MAINTENANCE

SERVICE: Interval, days _____ Consumables, kg _____

Returnables, kg _____ Man Hours _____

CONFIGURATION CHANGES: Interval, days _____ Man/Hrs. Req. _____

Deliverables, kg _____ Returnables, kg _____

SPECIAL CONSIDERATIONS/See Instructions

PAYLOAD ELEMENT NAME Advanced Automation Technology Development **CODE** GRUM 2010

CONTACT

Name Roy Olsen

Address Grumman Aerospace Corporation
A09-25
Bethpage, NY 11714

Telephone 516 575-4229

STATUS

- ☐ Operational
- ☐ Approved
- ☐ Planned
- ☒ Candidate
- ☐ Opportunity

TYPE

- ☐ Science & Applications (non-commercial)
- ☐ Commercial
- ☒ Technology Development
- ☐ Operations

Type Number (see Table A) 14

First flight, yr 1991
No. of flights As needed
Duration of Flight, days As needed

Importance of the Space Station to this Element

1 = low value but could use
10 = vital

Scale 1 - 10 7

OBJECTIVE Generate the technology base for teleoperator and autonomous space systems that hold the potential for substantially increasing the orbital capability of unmanned science experiments and autonomous operations of space station.

DESCRIPTION This technology development mission includes developing artifical intelligence approaches to planning, monitoring, controlling, and diagnosing subsystem operations as well as the technology for teloperation and robotics in support of remote servicing assembly and related manipulating tasks required for maintenance and operations. The initial space station that provides an integrated system and environment would be the ideal test bedfor development

ORBIT CHARACTERISTICS

Apogee, km _____ Perigee, km _____ Tolerance ± _____
Inclination, deg _____ Tolerance ± _____
Nodal Angle, deg _____ Ephemeris Accuracy, m _____
Escape dV Required, m/s _____

POINTING/ORIENTATION

View direction ☐ Celestial ☐ Solar ☐ Earth
Truth Sites (if known) _____
Pointing accuracy, arc sec _____ Field of view, deg _____
Pointing Stability (Jitter) arc sec/sec _____
Special Restrictions (Avoidance) _____

POWER

☒ AC ☐ DC

	Power, W	Duration, hrs/day	
Operating	Minimal		☐ Continuous
Standby	Minimal		
Peak	Minimal		

Voltage, V Standard Frequency, Hz Standard

DATA/COMMUNICATIONS

Monitoring requirements:
☐ None ☒ Realtime ☐ Offline ☐ Other _____
☐ Encryption/Decryption Required
☒ Uplink Req.: Command Rate (KBS) TBD Frequency (MHZ) TBD
☒ On-Board Data Processing Required
Description Testing of AI Techniques & Robotics Systems

Data Types: ☒ Analog ☒ Digital ☐ Hrs/Day _____
Film (Amount) _____ Voice (Hrs/Day) TBD
Live TV (Hrs/Day) _____ Other _____
On-Board Storage (MBIT) TBD
Data Dump Frequency (Per Orbit) TBD
Recording Rate (KBPS) TBD Downlink Frequency (MHZ) TBD

THERMAL

☒ Active ☐ Passive Depending on Equipment

Temperature, deg C	operational min	Standard	max	Standard
	non-operational min	"	max	"
Heat Rejection, w	operational min	"	max	"
	non-operational min	"	max	"

EQUIPMENT PHYSICAL CHARACTERISTICS

Location: ☒ Internal ☐ External ☐ Remote

Equipment ID/Function ☒ Pressurized ☐ Unpressurized

L,m ____ W, m ____ H,m ____ Stowed

L,m ____ W,m ____ H,m ____ Deployed

Launch mass, kg ____

Consumables Types ____

Acceleration sensitivity, g min ____ max ____

CREW REQUIREMENTS

Crew Size 2 Task Assignment Tech. & Systems Integrator

Skills (See Table B)

SKILL						
LEVEL						
Hrs/Day						

EVA ☐ YES ☒ NO Reason ____ Hrs/EVA ____

SERVICING/MAINTENANCE

SERVICE: Interval, days ____ Consumables, kg ____

Returnables, kg ____ Man Hours ____

CONFIGURATION CHANGES: Interval, days 30 Man/Hrs. Req. 10

Deliverables, kg ____ Returnables, kg ____

SPECIAL CONSIDERATIONS/See Instructions